AMERICAN

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STEAM NAVIGATION, COMMERCE, FINANCE,

INSURANCE, BANKING, MINING, MANUFACTURES.

HENRY V. POOR, *Editor.*

SATURDAY, MAY 28, 1859.

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NEW-YORK:

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JOHN H. SCHULTZ & CO.

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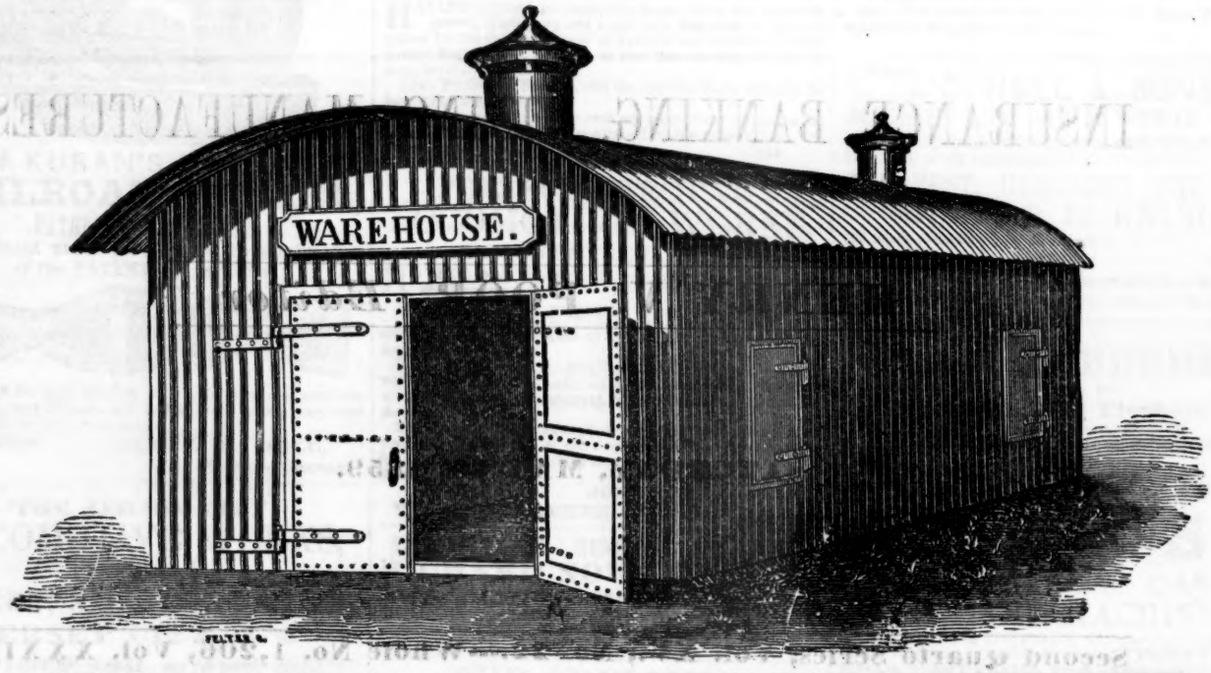

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American Railroad Journal.

PUBLISHED BY J. H. SCHULTZ & CO. No. 9 SPRUCE ST.

New York, Saturday, May 28, 1859.

Locomotive Department on the Illinois Central Railroad.

The cost per mile of running and maintaining the Locomotive Department of the Illinois Central Railroad, for the months of February and March, of the present year, was as follows:

No. of miles run	140,045
No. of cars per train	6.49
Lbs. waste used	3,776
Gallons oil "	2,592
Cords of wood used	5,757
Tons of coal "	1,554
Wages of engineers and firemen	$9,454
Repairs	17,556
Value of waste, tallow and oil	2,455
Value of wood and coal	27,213
Cleaning engines	2,031
Total cost	$60,812
Cost of oil, waste and tallow per mile	00.82
Cost of wood and coal "	09.18
Wages of engineers and firemen "	03.87
Cost of repairs "	05.96
Cost of cleaning "	00.69
Total cost per mile	20.53
Average miles to pint of oil	14.88
" " cord of wood	41.98
" " ton of coal	36.35

Estimated value of wood, $4 16 per cord.
" " coal, $2 10 per ton.

The above statement represents the entire cost of running and maintaining the Locomotive Department.

Georgia Railroad and Banking Company.

The report of this company for the fiscal year ending April 1, 1859, gives the following statement of earnings from business of the road during that time:

From Passengers		$354,562 75
" Freight		755,554 76
" Mail		44,503 57
		$1,154,621 08
And the expenses were:		
Conducting transporta'n	$144,244 83	
Motive power	190,055 15	
Maintenance of way	156,393 64	
" cars	54,276 25	
Relaying iron, outfit, etc.	59,288 08	
		610,257 95
Net profits		$544,363 13
Net profits from operations of the bank.		71,834 75
Total net income		$616,197 88
Dividends declared		311,700 00
Carried to credit of reserved fund		$304,497 88
Add balance to credit of reserved fund, March 31st		619,350 56
Balance to credit of reserved fund		$923,848 44

The increase in gross earnings is as follows:

From Up freight		$20,850 42
" Down "		109,187 88
Miscellaneous		2,867 80
		$132,906 10
Less decrease of revenue from Passengers	$11,715 54	
Way freight from connecting roads	3,141 81	14,857 35
Total increase		$118,048 75

The sources of revenue have been as follows:

	Through.	Local.
Western & Atlantic R. R.	$189,224 19	$1,597 12
E. Tenn. & Georgia R. R.	50,202 14	.....
Rome Railroad	43,508 15	.....
Atlanta	29,883 75	29,883 76
Atlanta and W. P. R. R.	39,708 93	79,417 87
Georgia Railroad	.....	281,699 33
Passengers	116,622 52	232,486 85
Miscellaneous	4,000 00	11,882 90
Mail	.....	44,503 57
Total	$473,149 68	$681,471 40

The business of the past year has been very profitable, and both gross and net profits exhibit not only an increase over the previous, but are also above the average of preceding years. This increase is due to the large increase in the transportation of cotton, and the legitimate increase in return freights, which naturally attended it. The proportion of net to gross profits is also much larger than the average of former years, arising mostly from the smaller quantity of new work done—the outfit being unusually full and perfect.

The bonded debt of the company is now $373,060, (all incurred for subscriptions to other roads). The president recommends that it be met as it falls due, and no renewal asked or accepted for a dollar.

The relaying of the remaining 25 miles of the main line with a heavier rail is recommended; also both branches, to Washington and Athens, with a light T rail on cross-ties—being now laid with a strap rail on continuous wooden stringers. Three or four locomotives will also be required the coming year.

MONTHLY EARNINGS FOR 1858–9.

	Passengers.	Freight.	Mails.	Total.
Ap'l	$24,185.63	$52,536.70	$3,708.64	$80,430.97
May	23,525.29	59.448.37	3,708.63	86,682.29
June	20,275.62	24,565.78	3,708.63	48,550.03
July	25,442.45	31,783.07	3,708.63	60,934.15
Aug.	25,198.87	48,766.21	3,708.63	77,673.71
Sept.	23,999.78	61,609.28	3,708.63	89,317.69
Oct.	26,860.12	110,506.62	3,708.63	141,075.37
Nov.	33,453.05	73,078.73	3,708.63	110,240.41
Dec.	43.108.99	84,006.86	3,708.63	130,824.48
Jan.	43,977.97	74,759.83	3,708.63	122,446.43
Feb.	32,803.62	60,080.12	3,708.63	96,592.37
Mar.	31,731.36	74,413.19	3,708.63	109,853.18
Tot.	$354,562.75	755,554.76	44,503.57	1,154,621.08

CONDENSED BALANCE SHEET.

	Dr.
Capital stock	$4,150,000 00
Bonds of the company	373,060 00
Income from earnings of road	1,181,518 89
Reserved fund	473.890 56
Discount, interest, rent, etc	83 772 20
Dividends on sto k	50,552 00
" unpaid	19,640 43
Due corporations and agents	163,329 07
Depots	252,939 44
Circulation	1,293,618 45
	$8,048,321 04

	Cr.
Cost of road and outfit	$4,174,491 94
Conducting transportation	617,166 75
Salaries, office expenses, etc.	28,773 53
Interest and taxes	33,715 92
Real estate, etc	146,072 36
Materials on hand	124,129 71
Stock in other roads	829,550 00
Bonds of other companies	59,500 00
Discounted notes and domestic bills	654,799 22
Bills of exchange	471,279 43
Assessments on stock unsettled	337 50
Due by banks, agents, etc.	176,473 20
Cash	732,031 48
	$8,048,321 04

OFFICERS:

JOHN P. KING, *President.*

GEORGE YONGE, *Superintendent.*

Book Notices.

ENGINEERING PRECEDENTS FOR STEAM MACHINERY; embracing the performances of Steamships, and experiments with propelling instruments, condensers, boilers, &c., accompanied by analysis of the same—for Engineers, by B. S. ISHERWOOD, Chief Engineer, U. S. Navy. 127 pages. H. BALLIERE, 290 Broadway, N. Y.

This is the first publication of what is intended to be a series, if the demand is sufficient. The whole is original matter, and arranged in the most practical and useful manner for Engineers, and cannot fail to be a most valuable book of reference in matters of this kind.

The contents of the present book are: British gun boats in China; British Dispatch Screw Steamer Lynx; Screw Steamer Sydney, Ireland and Scotland; British war-screw Steamship Conflict; Comparative Experiments with the screw and paddle wheel, as applied to the *U. S. Steamers Spencer and McLane.* Copious tables are given showing the results of the operation of the various vessels enumerated. The analysis are thorough, and all the elements of power and resistance so separated and arranged, as to be readily understood.

As a matter of general interest we extract the following description of the British gun boats in China:

These gun-boats were some of those constructed in 1856, by the Admirality, for a projected attack upon the fortifications of Cronstadt: as this attack was not made, their adaptation for such a purpose was not tested; but those sent to China proved of indispensable service in the military operations on that coast, and fully established the great value of this description of vessel for literal warfare.

They were of three classes, and known as gun-boats of 40, 60, and 80 nominal horses power. The 60 horses power class was the original type, and the other two classes were merely variations on it. The hulls were of wood, plainly finished, and did not possess more than the usual strength given to naval steamers of their tonnage. The 40 horses power class was rigged as two-masted fore-and-aft schooners; the 60 horses power class was rigged as three-masted fore-and-aft schooners; the 80 horses power class was rigged as three-masted fore-topsail schooners. A light jib-boom was carried, but the bows of all were without either cut-water or bow-sprit, in order to permit the forward pivot gun to stand over the line of the keel and fire directly ahead. The hulls of all had the same beam, namely, 22 feet; but they differed in length, depth, and draught of water; those of the 40 horses power class were 109 feet 10 inches long, those of the 60 horses power class were 100 feet long, and those of the 80 horses power class were 125 feet long between perpendiculars. The water-lines of the 40 and 60 horses power classes have much fullness, the floors have little dead-rise, and the bilges are but slightly rounded. The water-lines of the 80 horses power class are sharper, the bilges better rounded, and there is more dead-rise to the floor. The load draught of water of the 40 horses power class is 6 feet; of the 60 horses power class, 7½ feet; and of the 80 horses power class, 8¼ feet.

The armament of the 40 and 60 horses power classes was the same, namely, one 8 inch shell gun of 95 cwt., (sometimes a long solid 32-pounder was substituted), pivoted on the bow; one 10 inch shell gun (sometimes an 8 inch shell gun was substituted,) pivoted amidships; and two 24-pounder brass howitzers aft. The 40 horses power class was originally intended to carry only one 10 inch shell gun. The armament of the 80 horses power class was two brass 24-pounders aft, two brass 24-pounders forward, one 10 inch shell gun pivoted amidships. When the battery was fired in the broadside direction, the vessel heeled over greatly beneath the recoil, although fitted with projecting rolling-plank on the bilges.

None of the gun-boats carried their battery at sea, their guns being transported by larger vessels. The 40 and 60 horses power classes were towed from England to China by large steamers; the 80 horses power class sailed the distance with their screws hoisted out of water, and are said to have proved themselves good sea-boats. All the gun-boats carried but four days' water in tank, depending entirely upon their distilling apparatus for their daily supply. The least possible quantity of provisions was carried, and the coal in bunker was limited to three and a half or four days' steaming, both on account of deficiency of space and to reduce the vessel's draught of water. The smoke pipes were hinged, in order to be laid upon the deck when the vessel was under sail alone.

The 80 and 60 horses power classes were fitted with two engines; the 40 horses power class had only one engine. All the engines were non-condensing, direct acting, and horizontal; and when two were used, both were placed on the same side of the keel. There was no separate expansion valve, but the steam was cut off by lap on the steam valve, and the link motion.

The boilers, which were three in number for the 80 and 60 horses power classes, and two in number for the 40 horses power class, were all of the same type. They had cylindrical shells with flat ends; the farther smoke connection, or uptake, was of thin iron, bolted to the shell, but not composing part of it. In the near end of each boiler was an inner cylinder of 26 inches diameter, the upper half of which was the furnace and the lower half the ash-pit. The principal heating furnace was composed of iron tubes, lying horizontally, in the same direction as the furnaces and immediately behind them; the upper row of flues was on the same level with the tops of the furnaces. Between the furnace and near the tube plate was a brick bridge 9 inches wide. The draught of the boiler depended entirely on the blast produced in the chimney by the exhaust steam from the engine; the natural draught was so very sluggish that about four hours were required to raise steam from cold water with Welsh coal. The blast-pipe had three nozzles of different diameters, to be used as more or less steam was required, and the back pressure against the pistons, due to them and other causes, varied from 3 to 6 pounds per square inch above the atmosphere, according to the consumption of coal per hour. The farther smoke connection, or uptake, could be swept of its ashes instantaneously and very completely by a steam jet of 2 inches diameter, which drove them out of the top of the chimney; though when this operation was performed it was necessary, for an obvious reason, to bring the wind abeam. The maximum steam pressure these boilers were intended to be worked at, was 60 pounds per square inch above the atmosphere, but the usual average was 40 pounds. At the chimney end of the boiler there was a passage with a hatch over it; the passage was 3 feet wide to give room for sweeping the flues. A passage 21 inches wide extended also along both sides the boilers. The coal was principally stowed on both sides the engines and boilers, extending somewhat over them, and serving as a protection against shot; the remaining portion was stowed forward of the bulkhead. The whole of the machinery, in all the vessels, lies below the water line, and the length it occupies between bulkheads is about 32 feet.

All the gun-boats are propelled by two-bladed true screws, which are fixed with the 40 and 60 horses power classes, but hoist up with the 80 horses power class. The screw and engine shafts can be disconnected by unbolting a pair of discs; this, however is a slow process, and when it is desired to drag the screw revolving, the connecting-rods of the two engines are unkeyed from their crank-pins.

The 60 horses power class was the original type of gun-boat, and the object had in view when constructing it was to produce a vessel that could support two guns of large calibre for battering at point blank range a formidable fortress, and at the same time offer a target of the smallest possible size to the enemy. For this purpose, the vessels were to be of very small dimensions with pretty full water lines, to be low on the water, and to have so light a draught as to be able to run close in shore; as they were to receive the fire of the heaviest hostile ordnance, their machinery was to be protected by being placed below the water line, and behind the shelter of the coal-bunkers. Their steam power was to be what was necessary to carry them rapidly in and out of action, and for prompt manœuvering against wind and current. As these vessels were constructed for the sole purpose of attacking Cronstadt, and were expected to be destroyed in that service (for both officers and crews were to be volunteers), excellence of model, kind of machinery, economical application of the power, capacity to perform sea voyages of reasonable length, etc., were quite secondary considerations—very different from what they would have been had the vessels been destined for general instead of such special service. The great considerations were, small size hull, large size ordnance—the machiney being simply that which would weigh the least, cost the least, occupy the least space, and yet be sufficient for working the vessels quickly even against the current and wind, on the occasions it was expected to use them. The accommodations for officers and crew, and the quantity of coal and store carried, were, for the same reason, unimportant matters. The cannon, stores, coal, etc., were to be carried to the scene of action by large screw steamers, from which the gun-boats were to be fitted out and sent in as bull-dogs to bait a bear. As a necessary consequence of this programme, the hulls were made with tolerably full water-lines, to give strength and displacement; the spars were made very small, and the machinery adopted was a light non-condensing engine, working at a high rotary speed, with a steam pressure of from 50 to 60 pounds per square inch above the atmosphere, and following for two-thirds the stroke of piston. The boilers were tubular, with circular shells—simplicity, fewness of parts, and readiness of access for quick and easy repair, being the governing objects. Only 28 tons of coal were carried in the bunkers, very little water was taken in the tanks, the distilling apparatus being depended on for the daily supply; provisions and stores were also restricted to the least quantity; and then the officers and crew, limited to the fewest number, were thrust into what little space remained.

Census of Nashville, Tennessee.

A census of the city of Nashville, lately taken, gives the following results:

The population of the city proper is 25,113—of which 19,728 are whites, 10,757 males and 8,971 females; 5,385 blacks—of whom 1,758 are free. The population of the suburbs is 6,700, making a total of 31,813. The manufactures of the city reach $2,374,700; the total trade exclusive of manufactures, is 22,476,812. About one hundred steamboats visit the port during a year, with an aggregate tonnage of 108,000.

Detroit and Milwaukee Railroad.

The annual meeting of this company took place at Detroit on the 10th inst., at which a report was submitted of its affairs as they were on the 31st of Dec. 1858.

The paid up capital of the company on the 31st Dec. 1858, was as follows:

Share Accounts:

For amount received on 47,215 shares of $50 each	$2,360,750 00
Less amount of arrears on 1,287 shares of the above	31,595 26
	$2,329,154 74

Bond Account:

Sterling bonds of the Oakland and Ottawa R. R. Co., at 6 per cent., due 1873, viz:		
£2,600 non-convertible.		
28,400 convertible.		
£31,000, say	$155,000	
Dollar bonds of the Oakland and Ottawa R. R. Co., at 7 per cent., convertible, due 1873	51,000	
Dollar bonds of the Detroit & Pontiac R. R. Co., at 8 per cent., non convertible due 1863	150,000	
Dollar bonds of the Detroit & Pontiac R. R. Co., at 8 per cent., non-convertible, due 1863	100,000	
Dollar bonds of the Detroit & Pontiac R. R. Co., at 8 per cent., convertible, due 1866	250,000	
Dollar bonds of the Detroit & Milwaukee R. R. Co., at 7 per cent., first mortgage, convertible, due 1875	2,500,000	
Dollar bonds of the Detroit & Milwaukee R. R. Co., at 8 per cent., 2d mortgage non-convertible, due 1866	751,500	
Dollar bonds of the Detroit & Milwaukee R. R. Co. at 10 per cent., 3d mortgage, convertible, due 1863	750,000	
		$4,707,500 00
		$7,036,654 74
Balance		1,971,714 47
		$9,008,369 21

The complete examination of the accounts of the company, made up before the arrangement was completed for the advance of the $750,000 in January, 1858, showing the company to be in this position.

The actual debts then due were as follows:

Bill and bonds due, nearly $800,000, of which was then actually overdue and protested	$992,247
Int. coupons, due Nov. 15, 1857	110,379
Debts due to contractors and others for work already done	284,269
Interest and damages on protested notes.	36,456
Wages due to men engaged in the working of the opened line	48,000
Amount due for right of way and damages	12,000
Int. bonds due on shares up to the opening of the line	330,000
Int. due on bonds up to May 15, 1858	110,500
do do do Nov. 15, 1858	120,000
	$2,043,853
To that has to be added the cost of completing 46 miles of road—station buildings, rolling stock, sidings, fencing, ballasting, &c., say about	850,000
	$2,909,000

It will thus be seen that the amount of indebtedness actually incurred and owing when the present board was elected, was upward of $2,000,000; besides which a considerable sum had to be expended to complete the line. To meet that indebtedness, the company was in possession of the following assets:

Loan from G. W. R. R	$750,000
2nd mort. bonds, worth at par	600,000
Total	$1,350,000

And in addition, the earnings of the line. A further loan of $500,000 was effected from the Great Western Railway Company. This will make the present position of the company as follows:

Balance against capital as per acct. to 31st Dec. 1858		$1,971,714
Reduced by loan from Great Western Railway Co	$500,000	
By bonds due 1st Jan. 1860	332,000	
Balance of revenue account	144,270	
And old account arranged	100,000	
Bonds on hand to be issued	200,000	
		1,276,270
Total floating debt		$695,444

The expenditures of the company have been as follows:

EXPENDITURE.

By amount expended on the construction of the line prior to 1st January, 1858		$6,738,593 60	
Do. for rolling stock, viz:			
Locomotive engines and tenders	$123,968.13		
Pass., fr't & other cars.	245,583.21		
		$369,551 34	
			$7,108,144 94
By amount expended during the period, between 1st of Jan. and 31st Dec., 1858:			
For interest and discount on shares, bonds, loans, &c., including $332,005 83 of interest bonds on the capital stock of the Co. up to the opening of the line to Lake Michigan		$743,623 77	
For land, works, bridges, perm. way, &c.		575,251 71	
For stations, warehouses, wharves, &c.		163,342 60	
For workshops and machinery, incl'g fixed engines		23,770 08	
For electric telegraph		12,341 96	
For ferry steamer to for crossing Detroit river.		13,700 00	
By General Charges:			
Law charges	$9,411 26		
Engineering	25,395 43		
Salaries	17,086 63		
Agency	8,400 82		
Police force	365 10		
Office expenses	261 88		
Insurance and taxes	20,810 87		
Advertising, printing and stationery	1,828 00		
Office furniture	2,445 59		
Traveling and incidental expenses	4,143 86		
Rolling stock	$1,622,179 55		
Locomotive engines and tenders	134,890 79		
Passenger, freight and other cars.	143,153 93		
		1,900,224 27	
			$9,008,369 21

The Revenue for 1858 was as follows:

Revenue Account.

The following account shows the receipts and expenditures on revenue account for the year 1858:

RECEIPTS.

To amount received for the carriage of 127,414⅓ passengers	$170,614 45
To amount received for parcels and mails	17,608 27
To amount received for freight and live stock	174,567 24
	$362,589 96
To amount received for rents	2,448 57
	$365,038 53

EXPENSES.

	Am't.
By maintenance of way	$50,279 65
By locomotive expenditure	44,479 06
By repairs and renewals of passenger and freight cars	12,422 75
By passenger traffic expenses, including cost of steam ferry across Lake Michigan	48,692 71
By freight traffic do	47,678 34
By general charges	17,215 13
Total working expenses	$220,767 84
By balance	144,270 69
	$365,038 53

The report states that the great bulk of the amount required for the completion of the line, and providing it with rolling stock, has now been expended, and there is at present hardly an outlay, except for ballasting, fencing, and cattle-guards, in progress.

To meet the present liabilities of the company, a resolution was adopted, authorizing the directors "to issue stock, entitled to not more than ten per cent. per annum dividend, to the amount of $1,000,000, in conformity with the authority conferred upon this company by virtue of the act in relation to preferred stocks, passed at the session of the Legislature of 1859. And if the existing creditors of the corporation are willing to exchange their claims for such stock, it may be issued from time to time for that purpose, in addition to the above mentioned sum, but such additional stock shall in no case be entitled to a dividend greater than the interest payable on the claims for which it may be exchanged; *provided*, that the present debt of the company shall in no event be increased by virtue of such issue beyond the said sum of $1,000,000; and *provided further*, that all of said stock shall be redeemable and payable at par at any time after the issue thereof, upon six months' notice being given."

We copy the following from the report of the company:

As was stated in the report made by the President on the 1st of December, 1858, the financial position of the company, when the present Board was elected, proved, on examination, to be most critical and embarrassing. By great exertions the credit of the company has been very greatly raised, the line completed throughout to the lake, and considerable progress made in liquidating the large amount of indebtedness which was pressing so heavily upon the company. In accomplishing these results, about $420,000 of the second mortgage bonds have, up to the present time, been disposed of at 80 per cent., in payment of old debts. This plan will be continued until the full amount of this class of bonds has been issued.

The line was completed to Mill Point on the 1st September, 1858, and the present terminus at Grand Haven was brought into use on the 22d November, 1858.

The line was opened too late in the fall to permit of any large number of through passengers being conveyed last year; but two steamers are now running between Milwaukee and Grand Haven in connection with the trains of this company, and the Directors are happy to state that the number of passengers they are carrying is sensibly and satisfactorily increasing. As the season advances, the through passenger traffic will undoubtedly

materially improve; and when the new steamers, building specially for the route, are brought into use, they will so thoroughly command the confidence of the public that the Detriot and Milwaukee Railroad cannot fail at all seasons to secure a large proportion of the passenger traffic of the North-west.

The communication between Milwaukee and Grand Haven was regularly kept up throughout the winter for freight purposes and large quantities of flour, provisions, &c., were carried east from Milwaukee. This was a new era for the North-west, and the merchants and dealers there were, for the first time, enabled to have their property conveyed to the East during the winter, and at the same prices as were charged from Chicago. Several thousand tons of produce, which, without this line, must have remained in Milwaukee until the opening of navigation, were thus carried to market, and a great benefit thereby conferred upon the commercial interests of the North-west. Merchandise from the East, in considerable quantities, was also carried across the lake, during the winter, with regularity and dispatch. The great advantages of this line have thus been demonstrated to the merchants of the North-west, and freight is now being daily carried to Milwaukee by this route, although navigation has for some time been open.

The commercial revulsion during the autumn of 1857, aggravated by two successive deficient harvests in the West, pressed with great severity upon the North-western States, and therefore the business in that section of the country, during the last year, has been remarkably light. The quantity of freight which, under these circumstances, and on the first opening of the line, this company has carried, gives the board the greatest encouragement as to the growth of the traffic after the country shall have been blessed with productive harvests.

The local traffic, during the past year has been seriously affected by the causes which have operated to so great an extent in diminishing the business upon all the railroads in the country. A careful consideration of the present business of the line, and a review of the sources from which traffic will be derived, has led the Board to the conclusion that a good harvest, and the consequent revival of general business, will increase the local traffic to at least double the present weekly receipts. And when to that is added the through business already presenting itself with the increase which will follow from good harvests, there is no room for doubting that this company must, in a short time, be placed in a very satisfactory position.

The following gentlemen, being all members of the old Board, were elected Directors of the Company for the ensuing year, viz: Charles J. Brydges, Esq., Thomas Reynolds, Esq., Hamilton, C. W.; Edmund A. Brush, Esq., Nelson P. Stewart, Henry N. Walker, Esq., Detroit; Robert Gill, Esq., Thos. Cullen, Esq., Alexander Hayes, Esq., London, England; and William Govan, Esq., Glasgow, Scotland.

Marquette and Ontonagon Railroad.

It is stated that this company intend this Spring to commence operations at the Cleveland Mountain, and finish twenty miles westward this season. The land granted in aid by Congress, 4,840 acres per mile, then becomes available for the distance of constructed road. On the 20 miles immediately west of this place, the grant is overlapped by those of the Bay de Noquet and Marquette, and the Chicago, St. Paul and Fond du Lac Co.'s.

By the construction of the second section of 20 miles, the M. and O. Co. realize the entire amount of land granted per mile, instead of a portion of it, and open up valuable iron lands which fall to their selection. It is understood that running connections are to be established with the Bay de Noquet and Marquette Co., by which this section as soon as opened will be available.—*Lake Superior Journal.*

TREATISE

ON THE

PRINCIPLES OF CIVIL ENGINEERING

AS APPLIED TO THE

CONSTRUCTION OF WOODEN BRIDGES.

By S. S. Post, *Civil Engineer,*
And late Chief Engineer of the N. Y. & Erie R. R.

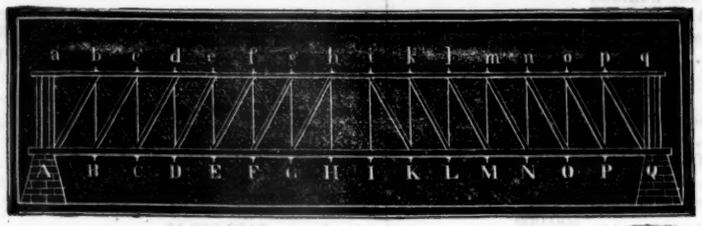
(Continued from p. 325.)

Example D.

Take a bridge with trusses of the "Howe" arrangement. Height of truss between chords 18 feet. Clear span 150 feet divided into 15 panels of 10 feet.

Greatest load on bridge at one time, exclusive of its own weight.

Fig. 68.



If 135,000 lbs. be divided by the number (15) of panels in the truss the result is a weight of 9,000 lbs. per panel. Each vertical tie must sustain this weight, taking half a panel on either side.

The ties H*h* and I*i* will then be subjected to a tension of 9,000 lbs. each. But in transferring these vertical strains to the points of support of the truss (AQ) the ties G*g* and K*k* become loaded each with the weight of two panels or 18,000 lbs.; the ties F*f* and L*l* with the weights of three panels etc.

Next suppose a weight of 15,000 lbs. to be applied successively at the points A, B, C . . . Q.

The maximum weight to be sustained by each of the vertical ties will be as follows:—

On H*h* and I*i*	.....	9,000+15,000=24,000	lbs.
" G*g* "	K*k*	18,000+15,000=33,000	"
" F*f* "	L*l*	27,000+15,000=42,000	"
" E*e* "	M*m*	36,000+15,000=51,000	"
" D*d* "	N*n*	45,000+15,000=60,000	"
" C*c* "	O*o*	54,000+15,000=69,000	"
" B*b* "	P*p*	63,000+15,000=78,000	"
" A*a* "	Q*q*	67,500+15,000=82,500	"

The weights which act vertically upon the braces will differ from these somewhat, on account of the 15,000 lbs. not being uniformly distributed over the truss.

When the weight is applied at A it can act vertically, only, and of course can produce no horizontal or oblique strain upon the system of timbers, etc., composing the truss.

Applying a weight of 15,000 lbs. at B it is found (§ 76) that 14,000 lbs. must be sustained at A, and 1,000 lbs. at Q. The pressure of 14,000 lbs. is transferred from B to A through the medium of the vertical tie B*b*, and the oblique strut or brace A*b*. The 1,000 lbs. pressure is transferred from B to *b* by means of the vertical tie, and thence in a direct line *b*Q which is the resultant of its strains upon the part of the system from B*b* to Q*q*.

One locomotive engine	84 tons.
One tender	20 "
Four loaded cars, at 24 tons each	96 "
Total weight of train	150 "

Of this load nine-tenths (135 tons) may be considered as uniformly distributed over the whole length of the bridge, and the remaining one-tenth (15 tons) as being an excessive weight of the driving wheels of the engine.

One-half of these weights will be sustained by the truss on either side of the bridge. Therefore, each truss will be subjected to a vertical pressure of 135,000 lbs. uniformly distributed, and to another of 15,000 lbs. acting successively upon each point of the length of the truss, as the engine passes across the bridge.

The length of each brace is $(18^2+10^2)^{\frac{1}{2}}=20.59126$ feet, and the ratio of the length of brace to the height of panel is $\frac{20.59126}{18}=1.14396$. The oblique strain upon the brace A*b*, in the direction of its length is, then $14{,}000\times1.14396=16{,}016$ lbs.

Next, applying the weight (15,000 lbs.) at C, it is found that 13,000 lbs. are sustained at A, and 2,000 lbs. at Q. The pressure of 13,000 lbs. is first transmitted through the brace B*c* producing an oblique strain of $13{,}000\times1.14396=14{,}871$ lbs.

Pursuing the calculations in this manner the maximum strains upon each brace in the truss are determined. In this case those strains are exhibited in the following tabular form:

TABLE OF MAXIMUM STRAINS UPON BRACES.

Designation of braces.	Vertical Pressures. Effect of 15,000 lbs.	Vertical Pressures. Effect of 135,000 lbs.	Vertical Pressures. Total Effect.	Oblique Strains. Effect of 15,000 lbs.	Oblique Strains. Effect of 135,000 lbs.	Oblique Strains. Total Effect.
A	15,000	67,500	82,500	.....	.....	.....
A*b*	14,000	63,000	77,000	16,016	72,069	88,085
B*c*	13,000	54,000	67,000	14,871	61,774	76,645
C*d*	12,000	45,000	57,000	13,728	51,478	65,206
D*e*	11,000	36,000	47,000	12,584	41,182	53,776
E*f*	10,000	27,000	37,000	11,439	30,887	42,326
F*g*	9,000	18,000	27,000	10,296	20,591	30,887
G*h*	8,000	9,000	17,000	9,152	10,296	19,448
K*i*	8,000	9,000	17,000	9,152	10,296	19,448
L*k*	9,000	18,000	27,000	10,296	20,591	30,887
M*l*	10,000	27,000	37,000	11,439	30,887	42,326
N*m*	11,000	36,000	47,000	12,584	41,182	53,776
O*n*	12,000	45,000	57,000	13,728	51,478	65,206
P*o*	13,000	54,000	67,000	14,871	61,774	76,645
Q*p*	14,000	63,000	77,000	16,016	72,069	88,085
Q	15,000	67,500	82,500	.....	.....	.....

Now,—in addition to the support they give to the weight of the bridge itself, the track, etc., the braces are subjected to the concussions indicated by the weights given in the last column of this table.

The concussions acting upon material more or less elastic, produce violent compressions, or extensions, as the case may be, of the fibre of the

material, followed by equally violent reactions until the elasticity of that fibre becomes injured and finally destroyed.

The yielding to compression of the fibre of the timber, as the weight of the train goes upon the bridge, and the consequent reaction as it goes off, are the principal causes of that vertical vibration to which this and most other trusses are subject, and to which more than to any other cause they owe their premature and rapid destruction.

Were it in other respects practicable and a site for a bridge could be obtained across a stream having a solid rock bottom, a chain might be attached, by one end to the lower extremity of each of the vertical ties in the truss, and anchored by the other end, perpendicularly, to the rock bottom.

Then by means of turnbuckles or other device, a tension could be produced upon each chain exactly equal to the maximum weight which, on the passage of the train, would be sustained by the vertical tie-rod to which it is attached.

In this case the tension on the chains would be equal to the weight sustained by the ties, as before stated, at—

B and P	.....	78,000	lbs. each,
C " O	.....	69,000	" "
D " N	.....	60,000	" "
E " M	.....	51,000	" "
F " L	.....	42,000	" "
G " K	.....	33,000	" "
H " I	.....	24,000	" "

Now it must be evident to every person, who will give the subject the least reflection, that, in this condition without any train upon the bridge, the truss, at every point, is subjected to a strain equal to what would be a maximum strain at those points on the passage of the train. It follows, then, that the transit of the train will produce upon the truss no additional vertical, or other strain, and, consequently, no deflection or vertical vibration, but each chain, in succession, will be, momentarily, relieved of its tension.

The method of loading a bridge by means of chains is, however, so infeasible that resort must be had to some other expedient for the accomplishment of this end. The counter-brace is the most practicable appliance for the purpose.

It has been ascertained by the preceding calculations, that while a maximum weight of 78,000 lbs. acts at B, 77,000 lbs. only are sustained vertically by the brace A*b*. The other 1,000 lbs. act upon the opposite end of the system, at a moment when it does not incur a maximum strain: the vertical pressure upon the brace Q*p* being but 63,000+1,000=64,000 lbs. It is found, also, that with a maximum of 69,000 lbs. at C, the vertical pressure on the brace B*c* is 67,000 lbs., while upon P*o* it is but 54,000+2,000=56,000 lbs., etc., etc.

Moreover, it is found that an oblique thrust of 88,085 lbs. on the brace A*b* is the result of the maximum pressure of 78,000 lbs, at B,—and a thrust of 76,645 lbs. on the brace B*c*, the result of 69,000 lbs. vertical pressure at C, and so on for each brace, as given in the last column of the 'table of maximum strains upon braces.'

If a weight of 78,000 lbs., at B or *b*, acts in the direction *b*A, with a force of 88,085 lbs. it is clear that a resistance, or thrust, of 88,085 lbs., in the direction A*b*, will be necessary to sustain the weight of 78,000 lbs.

It is, also, quite as obvious that, if the 78,000 lbs. be removed from B, and, in the opposite diagonal of the panel, another brace *a*B be inserted and made to act in the direction of its length with the force of 88,085 lbs., it will press downward at B with the same vertical effect as was produced upon the brace A*b* by the maximum weight of 78,000 lbs.

Between the brace (A*b*) and its counter-brace (*a*B), there is a perfect equilibrium of strains, each sustaining a vertical force of 77,000 lbs.—1,000 lbs. being sustained by the opposite end of the system. By replacing the 78,000 lbs. at B, the counter-brace (*a*B) is simply relieved from all strains, while upon the direct brace (A*b*) the strains remain, as before, subjected to their maximum pressures, as well while the train is off the bridge as when upon it.

From the foregoing considerations it is to be inferred that the only duty of the counter-braces, is to counteract the strains resulting from the passing load; while the office of the direct brace, is to resist all the vertical pressure which results from both weight of structure and passing load.

The necessary dimensions of the materials composing the bridge may be computed as follows:—

1. *Of the Counter-braces.*

The braces were found to be 20.6 feet or 247½ inches long. The counter-braces will be the same. Taking them of a uniform thickness of 9 inches, width-wise of the bridge, they will be 27.5 diameters long, and if of white pine (table VI.) will withstand a compression of about 380 lbs. per square inch of section. But if firmly bolted or clamped to the braces crossing them at the middle, they may be considered as reduced in length one-half, or to 13.75 diameters, and be capable of withstanding a force of 800 lbs. per square inch. Their depth will then be—

B*a* and P*q* $\frac{88,085}{9\times800}$=12¼ inches.

C*b* " O*p* $\frac{76,645}{9\times800}$=10¼ "

D*c* " N*o* $\frac{65,206}{9\times800}$= 9⅛ "

E*d* " M*n* $\frac{53,766}{9\times800}$= 7½+½=8 inches.

F*e* " L*m* $\frac{42,326}{9\times800}$= 6 +½=6½ "

G*f* " K*l* $\frac{30,887}{9\times800}$=4.3+1.7=6 "

H*g* " I*k* $\frac{19,448}{9\times800}$=2.7+2.3=5 "

Where the depth is less than 9 inches a correction is made to provide against deflection in that direction.

These counter-braces in a single truss will contain 150 cubic feet and weigh 4,500 lbs. at 30 lbs. per cubic foot.

2. *The Lower Chord.*

The panels being 10 feet long, the chord is divided into stretches of 10 feet, each of which may be treated as a beam for the support of the floor-beams, track, train, etc.

The maximum load upon the chord in each panel will be the 15,000 lbs. excess of engine driving wheels, 9,000 lbs. of the train and say 1,250 lbs. of floor, track, etc., in all 25,250 lbs. which, if uniformly distributed, will be equivalent to 12,125 lbs. at the middle of the panel.

To be quite safe, however, the 15,000 lbs. may be considered as applied directly at the middle and the remaining 10,250 lbs. uniformly distributed. The effect at the middle will then be 15,000 +5,125=20,125 lbs. And (by § 44)

$10^2\times20,125\times0.01168=23,506=BD^3$;

that is, the breadth multiplied by the cube of the depth, in inches, must give a product of 23,506. If the depth be taken at—

10 inches the breadth will be	.....	.....	23.5	inches.
11	"	"	"	"	"	.....	.....	17½	"
12	"	"	"	"	"	.....	.....	13.6	"

with sections of 235,194 and 163 inches, either of which will answer the conditions of cross strain, but may not those of horizontal strains to which the chord is subjected.

The weight of materials which will compose the truss being yet unknown, the horizontal strain upon the chord can be determined at this stage of the investigation, only approximately.

The whole weight of the bridge may be assumed at 180,000 lbs. The equally diffused portion of the train is 270,000 lbs. These weights, 450,000 lbs. evenly distributed are equivalent to 112,500 lbs. at the middle of each truss. Add to which, half the extra weight of the driving wheels (15,000 lbs.) and the result is a maximum vertical pressure of 127,500 lbs. at the middle of the truss. The horizontal strain at that point will be—

$$18 : 75 :: \frac{127,500}{2} : 265,625 \text{ lbs.}$$

and at 1,000 lbs. per square inch the chord will require a sectional area of 265⅝ square inches.

If desirable to make the breadth 28 inches, a depth of 9.5 inches will be sufficient, provided the chord is made entirely solid.

The difficulty of obtaining a solid chord, of such dimensions, leads to the necessity of adopting a combination of smaller timbers, secured together by means of splices, packing blocks, keys, bolts, etc. In this case the width of the chord may be made up of 4 pieces, each 7 inches in thickness.

A splice in each panel will cause a reduction of about 4 inches, and if the packing blocks, or combination keys, cut off half an inch on each side, a further reduction of three inches will be made, reducing the width of chord available for resisting the horizontal strain, to 21 inches.

The depth will then be increased to 12½ inches of solid timber, but as the angle-blocks and packing bolts will cut away about 2½ inches of the depth, it must be increased to 15 inches.

It is usual in packing a chord of this kind, to allow a space of an inch or more, between the pieces, for the vertical tie-rods; for ventilation of the timber and for arranging the width of the chord to suit the width which may be necessary for the braces and counter-braces. The length of bolts, the thickness of packing blocks and of the splicing pieces, will depend on the spaces so allowed.

The weight of the bottom chord may be estimated as follows:—

16 pieces of pine, 40 ft. long, 15×7 in. =466⅔ cub. ft.	14,000 lbs.
240 iron bolts, 33 in. long, ¾ in diameter, nuts, washers, etc., at 6 lbs.	1,440 "
Packing and splicing blocks, straps, keys, etc.	560 "
Weight of lower chord complete	16,000 lbs

3. *The Top Chord.*

The breadth of the top chord, will, of course, correspond to that of the bottom one, and as it is liable to compression only, the whole section can be made available to resist that strain, which, at the middle of the truss, is 265,625 lbs. as in the case of the lower chord.

If the depth be made 11 inches, the length of each panel will be 11 diameters, and the chord will be capable of resisting a thrust of 875 lbs. per square inch. Then $11\times28\times875=269{,}500$ lbs., an excess of 3,875 lbs. Its weight will be—

16 pieces pine, 40 ft. long, 11×7 in., 342 cub. ft.	10,260 lbs.
240 iron bolts, heads and nuts complete	1,440 "
Packing blocks, splicing pieces, straps, etc.	300 "
Weight of top chord complete..	12,000 lbs.

4. *The Principal Braces.*

It has been assumed that the half weight of the bridge is 90,000 lbs. which is at the rate of 6,000 lbs. per panel. Adding the effect of this weight to that of the train as given in the table of maximum strains upon braces, the result will be—

	Vertical, lbs.	Oblique, lbs.
On braces G*h* and K*i*	23,000	26,311
" " F*g* " L*k*	39,000	44,614
" " E*f* " M*l*	55,000	62,918
" " D*e* " N*m*	71,000	81,221
" " C*d* " O*n*	87,000	99,525
" " B*c* " P*o*	103,000	117,828
" " A*b* " Q*p*.	119,000	136,131

If each of these oblique strains be divided between two braces, having a uniform thickness of 7.5 inches, and the half length of those braces be taken as was done with the counter-braces, they will resist a thrust of 740 lbs. per square inch, and their depth will be very nearly equal to their corresponding counter-braces.

The depths of the braces will then be—

G*h* and K*i*	$\frac{26{,}311}{740\times7.5\times2}$	$=2\frac{1}{2}+2\frac{1}{2}=4\frac{1}{2}$	inches.
F*g* " L*k*	$\frac{44{,}614}{740\times7.5\times2}$	$=4\times1\frac{1}{2}=5\frac{1}{2}$	"
E*f* " M*l*	$\frac{62{,}918}{740\times7.5\times2}$	$=5\frac{1}{2}+\frac{1}{2}=6\frac{1}{2}$	"
D*e* " N*m*	$\frac{81{,}221}{740\times7.5\times2}$	$=7\frac{1}{2}+\frac{1}{2}=7\frac{1}{2}$	"
C*d* " O*n*	$\frac{99{,}525}{740\times7.5\times2}$	$=9$	"
B*c* " P*o*	$\frac{117{,}828}{740\times7.5\times2}$	$=10\frac{1}{2}$	"
A*b* " Q*p*	$\frac{136{,}131}{740\times7.5\times2}$	$=12\frac{1}{2}$	"

An addition is made to the resulting depths of the first four sets of braces, to provide against upward or downward deflection.

These braces contain $233\frac{1}{3}$ cubic feet, and weigh 7,000 lbs.

5. *The Vertical Ties.*

The weight to be sustained by the vertical ties, will be increased by the pressures growing out of the weight of the bridge, and which have been added to the vertical effect upon the brace.

As there will be the thrust of two braces, and of a counter-brace, intermediate, upon an angle block; and as there may be three open spaces in the chord, through which vertical rods can be passed without cutting away any of the fibres of the chord: every vertical tie may be composed of three separate iron bolts or rods, each sustaining one-third of the stress.

The length of these bolts will be about 21.25 feet, to which, for the purpose of estimating their weight, 9 inches may be added as an equivalent for their heads and nuts, making their whole length 22 feet.

Diameters and Weights of Bolts.

Designation of the ties.	Weights to be sustained. lbs.	Weight per bolt. lbs.	Diameter of bolts. inches.	Weights of 6 bolts. lbs.
H*h* and I*i*	30,000	10,000	$1\frac{1}{4}$	438
G*g* " K*k* ...	45,000	15,000	$1\frac{1}{4}$	655
F*f* " L*l*....	60,000	20,000	$1\frac{1}{4}$	915
E*e* " M*m* ..	75,000	25.000	$1\frac{1}{4}$	1,218
D*d* " N*n*...	90,000	30,000	2	1,386
C*c* " O*o* ...	105,000	35,000	$2\frac{1}{4}$	1,564
B*b* " P*p* ...	120,000	40,000	$2\frac{1}{4}$	1,754
Total weight of 42 bolts				7,930

When the bridge is not loaded, each of the counter-braces B*a* and P*q* has a vertical pressure of 77,000 lbs. which must be resisted by ties at A*a* and Q*q*. If three iron bolts $1\frac{1}{4}$ inches in diameter, be used for each of these ties, the six bolts will weigh 1,218 lbs., and the total weights of the 48 bolts will be 9,148 lbs.

The screw end of the bolts should be enlarged so that the whole thread will project beyond the diameter of the body of the bolt; otherwise the diameter for the entire length should be increased as much as the depth cut to make the thread.

6. *Angle-blocks and Counter-clamps.*

Cast iron angle-blocks and counter-clamps, of a length equal to the width of the chord, and a width and depth proportionate to the force exerted upon them, should be used to equalize the pressures and prevent any crushing of the chords transversely of their fibre, by the tension of the rods, or the thrust of the braces and counter-braces.

At 300 lbs. per square inch the width required for these at B and *b* will be 14.3 inches, and at H and *h* $3\frac{4}{7}$ inches. If 200 lbs. be taken as the limit the extremes of width will be 21.5 and 5.5 inches. To suit the depth of the braces and counter-braces, the angle-blocks at B and P should have a bearing of about 18 inches, and at G and K, 6 inches.

The weights of the angle-blocks and clamps will depend very much on the judicious disposition of the metal in giving them a proper form. They will probably range from 200 to 1,600 lbs. for each vertical tie and average 650 lbs. making the total weight for the truss 10,400 lbs.

7. *The Lateral Braces.*

The trusses should be connected at the top by lateral ties and braces, or one brace and two ties for each panel will be sufficient. The dimensions will be most likely to depend upon the violence of winds, and the surface exposed thereto. To resist a pressure against the top chord, of 20,000 lbs. per panel, the following will be sufficient:—

16 pine braces, 16 feet long, $7\times8=100$ cubic feet	3,000 lbs.
30 iron ties, 26 ft. long, $1\frac{1}{4}$ in. diameter,	2,622 "
Total top lateral bracing	5,622 lbs.
One-half on each truss,	2,811 "

The bottom chords require a very thorough system of lateral bracing, to resist the surges of the engine and train. Much depends upon the fidelity with which the ends of the floor beams are bolted to the chord, and the track stringers clamped to the floor beams. Braces and ties may be conveniently inserted below the floor beams, when these rest upon the chords.

The following may suffice:—

260 bolts, 3 ft. long, 1 inch in diameter,	2,100 lbs.
64 stirrups for track stringers	1,000 "
30 pine braces, 19 ft. long, 6×7 in., 167 cubic feet	5,010 "
16 iron ties, 21.5 feet long, $1\frac{1}{4}$ inch diameter	1,728 "
32 angle-blocks, at 30 lbs. each.	960 "
Total bottom lateral bracing..	10,798 lbs.
One-half on each truss	5,399 "

8. *Miscellaneous Items.*

The end posts A*a*, Q*q*, unless they are depended upon for ties have no office to perform, in sustaining the bridge or load, but to serve as abutments for the support of the half angle-blocks. Their dimensions are, therefore, of no very great importance. If they be made with a section of 6 by 30 inches, the four posts will contain 92 cubic feet and weigh 2,760 lbs.

The principal weights have now been computed and are as follows:—

Counter-braces	4,500 lbs.
Bottom chord	16,000 "
Floor-beams, track, etc., 160 feet	20,000 "
Top chord	12,000 "
Vertical ties	9,148 "
Angle-blocks and counter-clamps	10,400 "
Lateral bracing, top	2,811 "
Do. do. bottom	5,399 "
End posts	2,760 "
Total weight one-half of bridge	90,018 lbs.

It should be noticed here that this estimate is for a truss, 160 feet long, while the weight assumed (90,000 lbs.) was for 150 feet, the distance unsupported between the abutments. The end posts and $\frac{1}{16}$ of the chords, floor-beams, track, etc., are estimated to weigh 5,760 lbs., which, if deducted, leaves the actual weight of the 150 feet 84,258 lbs. or 5,742 lbs. less than was assumed.

The maximum weight which will bear upon the abutments at one end of the truss, to wit:

$\frac{1}{2}$ of weight of bridge	45,009 lbs.
$\frac{1}{2}$ of train less extra weight of drivers..	67,500 "
$\frac{1}{2}$ of extra weight of drivers	15,000 "
Total at end of truss	127,509 lbs.

The chord will require a fair bearing of 23 by 28 inches, at 200 lbs. per square inch; but, if a white oak bolster or *corbel* be interposed, its bearing upon the *wall plate* may be reduced to 16 by 28 inches, if the wall plate be also of oak.

9. *Of Horizontal Strains.*

The maximum vertical strains, at B and P are each 120,000 lbs.—still assuming the whole weight of the bridge at 180,000 lbs.—of which strains 105,000 lbs. may be considered as constant and 15,000 lbs. as variable.

When this variable pressure acts at B it produces a vertical effect of 14,000 lbs. upon the brace A*b* and 1,000 lbs. upon the brace Q*p*.

The horizontal effect upon the brace A*b*, of these constant and variable pressures taken separately will be,

18 : 10 :: 105,000 :	58,333$\frac{1}{3}$	lbs. constant, and
18 : 10 :: 14,000 :	7,777$\frac{7}{9}$	" variable, or
Total...	119,000 : 66,111$\frac{1}{9}$	"

acting on the whole length of the chord from A to Q and b to p.

When the variable weight acts at C, the maximum vertical pressure at that point is 105,000 lbs.; of which 90,000 lbs. are constant and 15,000 lbs. variable. Of this variable 13,000 act upon A through the brace cB and bA, and 2,000 lbs. upon Q through all the braces on the opposite side.

Then 18 : 10 :: 90,000 : 50,000 constant effect,
and 18 : 20 :: 13,000 : 14,444⅔ variable do.

the first of which acts only between the points B and P of the bottom chord, and c and o of the top chord, while the last acts from A to Q and b to p.

The maximum horizontal strain between B and P is 1,041⅔+58,333⅓+50,000+14,444⅔=123,819⅔.

The first item is the effect of the weig ht of one-half the extreme panel, that is—

18 : 2.5 :: 7,500 : 1,041⅔ lbs.

Taking the effects of the maximum weights at each point, the following will be the results:—

At	Vertical pressures. Variable.	Vertical pressures. Constant.	Horizontal strains. Variable.	Horizontal strains. Constant.	Horizontal strains. Maximum.	Application.
A	15,000	112,500	.....	.....	.....	
+	.....	7,500	.....	1,041⅔	.....	
B	14,000	105,000	7,777⅞	58,333⅓	67,252⅞	A to B
C	13,000	90,000	14,444⅘	50,000	123,819⅘	B to C
D	12,000	75,000	20,000	41,666⅔	171,041⅔	C to D
E	11,000	60,000	24,444⅘	33,333⅓	208.719⅘	D to E
F	10,000	45,000	27,777⅞	25,000	237,152⅔	E to F
G	9,000	30,000	30,000	16,666⅔	256,041⅔	F to G
H	8,000	15,000	31,111⅕	8,333⅓	265,486⅕	G to H
×	7,500	.....	31,250	.....	265,625	H to I

NOTE. × Refers to the centre point of the truss, and + to the half panels at the ends of the truss.

Taking the horizontal strain at the middle of the chord as a unit of comparison, the per centage of horizontal strains to each panel will be—

G to K and h to i	100	per cent.
F to G and g to h	97	" "
E to F and f to g	90	" "
D to E and e to f	79	" "
C to D and d to e	65	" "
B to C and c to d	47	" "
A to B and b to c	26	" "

Thus it appears that there exists a large surplus of material and strength in the chords towards their extremities.

The horizontal strains in this example are subject to considerable reduction, as will appear from the following considerations.

The height of truss was assumed to be 18 ft. This height was used in calculating the lengths of the braces, etc., consequently the half depths of the chords should be added, which will make the truss 19 1/12 feet high from centre to centre of chords.

The weight of the truss is 84,258 lbs. as computed, or 5,742 lbs. less than was assumed.

The weights of braces, counter-braces, vertical ties, angle-blocks and counter-clamps, are not evenly distributed. Without going into a close calculation of these, it will be sufficiently accurate to assume that they are in proportion to the weights sustained by the vertical tie-bolts. Reckoning from H to A, their weight will not vary much from (800+1,200+1,600+2,000+2,400+2,800+3,200+1,524)×2=31,048.

The vertical effect at the middle of the truss, produced by 2,800 lbs. at C, 20 feet from the abutment A is 746⅔ lbs., for 75 : 20 :: 2,800 : 746⅔.

Making a similar calculation for each tie, the 31,048 lbs. unevenly distributed will be found to produce a vertical effect at the middle of the truss equal to 11,745 lbs.

The maximum load at the middle of the truss may be summed up as follows:—

	Lbs.
135,000 lbs. of the train uniformly distrib'd.	67,500
53,210 " " " bridge " "	26,605
31,048 " " " " unevenly "	11,745
15,000 " extra weight of engine at middle,	15,000
Total load at middle	120,850

The horizontal strain at the middle will be—

$$19\tfrac{1}{12} : 75 :: \frac{120{,}850}{2} : 237{,}478 \text{ lbs.}$$

This will admit of reducing the top chord to 10 inches, and the bottom chord to 14 inches in depth.

All dimensions of materials in this example have been calculated on the principle that their elasticity must not be impaired by use.

By avoiding joints and splices near the middle of the bottom chord; by a judicious disposition of the metal in the angle-blocks, etc., and by a careful revision of the whole arithmetical operations—substituting proportions different from those here assumed—something of a reduction may still be made in the quantity of materials, and much may be done to improve the structure.

(To be continued.)

Cincinnati Stock Sales.

BY KIRK & CHEEVER.

For the week ending May 23, 1859.

BONDS.	Per cent.	
Little Miami, 1st Mort.	6s	83 and int.
Covington and Lexington, 2d Mortgage	6s	80
Cinc., Ham. and Dayton, 2d Mortgage	7s	85
Indianap. & Cincinnati, do. do.	7s	89
STOCKS.		
Cincinnati, Hamilton & Dayton		60
Columbus and Xenia		87
Indianapolis & Cincinnati		50
Little Miami		89

Railroad Earnings.

The receipts of the Grand Trunk Railway of Canada for the week ending May 7, were $46,923 76
Week ending May 8, 1858 ..... 43,083 89

Increase $3,839 87
Total traffic from July 1st $1,954,086 17
Same period last year 2,037,481 51

Decrease $87,235 21

The earnings of the Erie Railroad for the month of April, 1859, were $380,342 75
Earnings April, 1858 ..... 558,129 28

Decrease $177,786 53

The April earnings of the New York Central road were in 1858 ..... $668,424
1859 443,500

Decrease $224,924

The April receipts of the Lake Erie and Western road (Wabash Valley) were:

Passengers	$21,594 09
Freight	43,754 92
Miscellaneous	3,333 00
Total	$68,682 01
April, 1858	93,812 62
Decrease	$25,130 61

The following is a statement of the earnings of the Pittsburg, Fort Wayne and Chicago Railroad for April, 1858–9:

	1858.	1859.
Freight	$61,737 57	$60,325 00
Passengers	72,356 31	70,324 67
Mails	4,482 29	7,825 00
Miscellaneous	1,229 17	3,000 00
Total	$139,805 34	$138,774 67

Comparative statement of earnings and expenses for the month of April, 1858 and 1859, of the Buffalo and State Line Railroad:

EARNINGS.

	1858.	1859.
Passengers	$46,007 16	$35,793 61
Freight	40,547 60	27,111 81
Other sources	1,150 00	1,624 50
Totals	$87,704 76	$64,529 92

EXPENSES.

	1858.	1859.
Construction	$493 90	.....
Maintaining road	13,886 71	15,105 64
Repairs of machinery	6,325 84	4,064 75
Operating	20,975 52	15,231 21
Totals	$41,681 97	$34,401 60

Decrease in gross earnings 23,174 84
" expenses 7,280 37
" net earnings 15,894 47

The earnings of the Rock Island Railroad in April were $72,319 09
April, 1858 ..... 92,120 00

$19,800 91

The earnlngs of the Macon and Western road for April were:

1858 ..... $25,034 69
1859 ..... 24,681 84

Decrease $35,285 27

The receipts of the Cattawissa Railroad Company for April, 1859, were $34,201 93
Less due connecting roads 6,097 14

Net receipts for April, 1859 ..... $28,104 84
Net reeeipts for April, 1858 ..... 23,079 57

1ncrease, 22 per cent $5,025 27

The following statement shows the business of the Reading Railroad for the month of April:

	1859.	1858.
Received from coal	$134,514 98	$137,416 35
Do. merchandise.	47,537 18	32,644 20
Do. travel, etc.	33,422 43	33,904 76
Total	$215,474 59	$203,965 31
Transportation, roadway, dumpage, renewal Fund, and all charges	112,374 83	113,914 98
Net profit for the month,	103,099 76	$90,050 33
Do. for previous 4 mos.	295,959 97	239,502 54
Total net profit for 5 months	$399,059 73	$329,552 87

Main Trunk of Georgia.

The iron is laid on this road some 15 miles beyound the terminus of the Savannah, Albany and Gulf Railroad, and 93 miles from Savannah. The road is graded some 15 miles further, with all the materials for construction prepared and on the ground.

Railroad on the Western Side of Lake Champlain.

Measures are again being taken for the construction of a railroad on the western side of this Lake. A meeting was lately held at Elizabethtown, to devise means for furthering the project,

Liberal subscriptions and releases of land for the track, it is said, could be easily procured. A. C. Hand of Elizabethtown, George W. Goff of Port Henry, and Oliver Keese, Jr., of Keesville, were appointed a committee to learn what encouragement and aid can be derived from all sources.

American Railroad Journal.

Saturday, May 28, 1859.

Weekly Summary.

Milwaukee and La Crosse Railroad.—This road was sold on the 21st inst., under the third mortgage, for seventy-five per cent. of the amount due, being over $1,500,000, thus winding up by far the most gigantic railroad swindle ever perpetrated. From the commencement, this road has been the victim of designing men, who have used it, and only too successfully, in fleecing the public. By dexterous appeals to it, aided by the daily press of this city, a considerable portion of which were undoubtedly directly subsidized, this scheme for a time obtained an extraordinary degree of popularity. The favor with which its stock and securities were held, was met by extraordinary, and in many cases fraudulent issues, till the amount reached some $18,000,000, and for a road which did not probably cost $6,000,000. What would seem extraordinary in this case is, that no attempt has ever been made to bring any of the offending parties to justice, or even to make them disgorge their ill-gotten gains. This was the company that bought up the Legislature of the State, as a means of obtaining a land grant, inflicting a deep stain, not only upon the State of Wisconsin, but upon our National character.

Only a few years since, Wisconsin was regarded with very great favor, as one of the safest of the Western States for the investment of capital, particularly its railroads. It now occupies the lowest position of any State. Everything there is in default—cities, municipal bodies of all kinds, as well as railroad companies. There is a general repudiation of farm mortgage bonds—which ingenious and pleasant contrivance whereby to raise money, was first devised in this State, and by which millions were drawn into it, to be squandered and lost in her railroads. At all these acts of repudiation the State Legislature connives. The courts will very probably follow the inclination of the people, leaving but a poor hope for the unlucky parties who have sent their money into this State.

Shipments of Specie.—Since and including the 30th of April, there have been shipped from this country to England $11,458,000 in specie. On Saturday, the 28th inst., $2,000,000 will probably go forward, making a total shipment for the month of $13,458,000; a sum larger than all the Banks in this city were accustomed to hold previous to 1858. That such a sum could be exported in so short a time, without disturbance to the money market, and without apprehension for the future, is gratifying evidence of the general soundness of the country, and we have learned a useful lesson in political economy—that a gold producing country may ship this metal with the same propriety and safety as any other of its products.

Railroad competition continues without any abatement, and without any immediate prospect of its ceasing. We presume that the managers of the Penn., and the B. and O. Railroad, feel that they cannot meet the terms of the New York Central without forfeiting their places. These roads were built mainly to advance the trade of the cities of Philadelphia and Baltimore. Their *geographical* position has been supposed to give them an advantage over New York for the trade of some portions of the interior. To admit that they do not possess such advantage would be to give up ideas that have become traditional with the people of these cities. One cannot help appreciating the difficulty of their positions, but we do not see that it is in fact much more difficult than that of the managers of the New York Central, who do not like to admit what would seriously impair their moral position, if not their revenues.

Railroad Earnings.—We give below a comparative statement of the earnings of a number of our leading roads for the month of April for three years past. Many show a regular and most extraordinary decrease. That of the roads terminating at Chicago is the most marked. The aggregate of their receipts do not equal one-half of what they were two years ago. The loss must, in a great measure, be due to the small crops of the two years past, and to the almost entire stop put to emigration from the east to the west. There are 600,000 people in the State of Iowa, 800,000 in Wisconsin, and 200,000 in Minnesota—more than a million of whom have been carried there, with all their effects, within the past *nine* years. The transportation of this immense crowd was of itself a lucrative business to East and West lines. This particular kind of traffic is nearly at an end. It cannot be doubted, however, that the commerce which this population will create, when a sufficient time shall have elapsed to have them profitably employed, will supply a traffic to the roads far greater than the mere carriage of persons. Subjoined is the comparative statement referred to:—

Roads.	1857.	1858.	1859.
N. Y. and New Haven...	$76,212	$68,595	$77,861
New York and Central..	713,988	668,424	486,697
New York and Erie	526,029	558,129	380,342
Michigan Central.....	298,299	223,010	143,143
" Southern	237,455	180,133	144,512
Galena and Chicago.....	194,217	139,439	90,041
Chicago and R. I.....	155,710	92,120	72,319
Illinois Central.....	206,341	179,991	152,512
Chic., Burlington and Q.	115,832	83,180	79,987
Milwaukee and Miss....	45,086	76,089	.....
Terre Haute and Alton..	68,076	75,832	.....
Wabash Valley.....	31,468	93,312	68,682
Little Miami.....	81,153	91,804	84,823
Clev., Columbus and Cin.	95,244	94,547	81,425
Pittsb'g, Ft. W. and Chic.	162,742	139,807	138,774
Pennsylvania.....	488,165	550,595	.....
Baltimore and Ohio.....	464,948	485,596	369,067
New Jersey Central.....	63,049	70,907	81,824

The Prospect for the Future.—We have in the United States, in a degree possessed by no other country, a corrective of commercial revulsions, or of an excessive stimulus of any particular interest, (whereby the production, or the means for production exceeds the demand,) in the rapid growth of our population; or the equally rapid increase in their capacity to consume. For example: the annual increase of our population is at the rate of 3.50 per cent. Our total population in 1850 was 23,200,000, the annual rate of increase, consequently, has been 812,000, which at the present time would give us a total of 31,000,000. Assuming a similar rate for the future, the annual increase would be 1,080,000. There is no doubt whatever, that the present increase of population in the United States is at a rate exceeding a million of souls. We have, therefore, an annually increasing domestic demand for our products, equalling the wants of *one million* of people. Our industry can safely expand in a similar ratio. But we cannot expect that population and production will always proceed at a uniform pace; the one moves forward by a regular law; the other is influenced by extraordinary causes, by which some one department of industry is always pushed to excess. Fortunately, however, a pause, or a slight decrease in production, is all that is necessary to let demand ever take it. The aberrations of trade, or commercial excesses of any kind, have with us consequently, healthy correctives, working with all the regularity of law and in a manner so speedy, that a year or two is all that is needed to give to our most depressed interests activity and life.

We have now an excellent illustration of the correctness of these remarks, in the prosperous condition of the manufacturing districts at the East, particularly in New England. Only a short time since, the manufacture in cotton goods was pushed to a point far exceeding the demand. This, necessarily, checked the construction of new works. The demand in the meantime has so far increased, that embarrassed as is a portion of the country—particularly the north-western States—our cotton mills are full of work, with a better demand than has existed for years. A prosperous period of considerable duration may now be safely counted upon for this branch of industry. The same is true of many others. With the exception of iron, all the manufacturing interests of the country are in a prosperous condition.

The only portion of the country really embarrassed at the present time, is the northwestern States, owing mainly to the unproductive seasons. Should the present prospects of good crops be realized, they will go far towards restoring the wonted prosperity of this section. A million more mouths upon our own soil are to be fed every year, and the consumption of food of all kinds is likely to keep pace pretty nearly with the supply.

Another constantly increasing source of demand is the increasing ability of our people to purchase and consume. This is in much greater ratio than the gain of our population. It is in ratio to the progress of inventions and the arts, and to the means that are supplied for the interchange of commodities. The internal and foreign trade of the country, which measures the degree of consumption, has more than doubled within ten years past. Our population in the meantime has increased at the rate of only 31 per cent. We are as likely to witness as rapid progress for the next, as for the past ten years. These elements have been little regarded, heretofore, in the science of political economy, from the slow progress of population in the old States, and from the fixed and unchanging condition of the great mass of their population. Here labor receives all it earns, and is stimulated to extraordinary exertions from the rewards it brings. We consume, consequently, vastly more than any other people in proportion to our numbers. The activity of demand is certain in all cases to overtake production, should that happen from any accidental course to slacken. No inter-

est can long remain depressed. For similar reasons, our railroads cannot long remain in their present depressed state. The same law that restores all other's interest, will soon come to the aid of this. With a good crop the coming season, we are confident that our roads have seen their worst, and that they will soon show the favorable results of their most prosperous days.

The prices for the week of the leading securities in the market have been as follows:

	May 19.	20.	21.	23.	24.	25.
Missouri 6s.....	83½	83½	83½	83½	83½	83½
Del. and Hud...	94	94	94	94	94	94½
Pacific Mail....	75	73½	74	72½	73	74½
N. Y. Central...	72½	72½	72½	71½	72½	72
Hudson River...	31½	31½	31½	..	31½	..
Panama 118		118½	117	..	118	118
Harlem Pref....	36	37	37½	37½	..	36½
Reading	45½	45	45½	45½	..	44
Michigan S'th'n.	9	9¾	9¾	..	..	9¾
" Pref. .	32	31⅝	31⅝	32	32	32
" C'nt'l..	41	41½	41½	41½	42	42
Ill. Cent'l shares.	..	55	..	55	53	53½
" 7s...	80	79	78	78	77½	74½
Gal. and Chicago.	62½	63½	62½	63½	63½	64
Clev. and Toledo.	27	27	26½	27	27½	27½
Chi. and Rock I..	62	62	62½	61	62	61
Tennessee 6s ...	90½	90½	91½	90½	90½	90½
Virginia 6s.....	94½	95½	94½	96	97	97

The closing prices for the week ending the 25th inst. were as follows:

Ohio 6s, 1860	102½
Erie, 4th mortgage, 75	42½
Hudson River, 1st mortgage, 7s	105
Do. do. 2nd do.	96¾
Michigan Southern, 2nd mortgage	56
Hannibal and St. Joseph R. R. Bonds.....	65
Erie Railrond Shares	7½

New City Loan.

Proposals are invited, as will be seen by an advertisement in another column, for $300,000 of "the *Central Park Improvement Fund*" for the city of New York. Tenders will be received to June 16th. Other conditions to be complied with may be learned by reference to the advertisement.

☞ A list of the principal makers of *Engineering, Surveying, and Drawing Instruments* will be found on another page. For the past year or two but little has been done by the "Profession"—hence but few demands have been made upon the manufacturers. The latter have not, however, been idle; but have improved the time, by making and laying by a stock, in order that they may be prepared to fill orders which must flow in upon them apace on the revival of business. A number of removals, changes, etc., have recently been made, which are noted in their cards, and to which we desire to directed attention.

Dubuque and Pacific Railroad.

We invite attention of contractors and capitalists to a notice in another column calling for proposals for the completion of this road. It is an enterprise that offers remarkable inducements to parties having means, as the road has an excellent route for business, and valuable land grant, equal in value to what the the road can be built for. Notwithstanding the depressed condition of railroads, we believe it will not be long before this project is favorably entertained by capital as a matter of investment.

Railroads of Connecticut.

Statement showing the operations of the Railroads of Connecticut, for 1858, according to the recent Report of the Railroad Commissioners of that State.

Name of Road.	Length.	Capital p'd in.	Indebtedness.	Cost. of r'd & equipment.	Rec'd from pass'gers.	Rec'd from freight.	Do. Miscellaneous.	Gross receipts.	Current expenses.	Net earnings.	Inter'st p'd.	Amount of Divid'ds.
New York and New Haven.....	62	$2,980,839	$2,194,051	$5,324,527	$645,254	$141,406	$49,950	$836,610	$607,501	$229,109	$142,640	$90,000
Hartford and New Haven	72	2,350,000	964,000	3,320,667	371,906	215,557	40,781	628,245	306,854	321,391	56,545	230,000
Norwich and Worcester	66	2,122 300	775,280	2,618 694	111,229	157,872	14,454	283,556	183,189	100,367	46,267	.....
Providence, Hartford and Fishkill	122	2,042,539	2,161,691	4,205,966	160,664	122,394	15,537	298,595	163,588	135,007	.....	.....
New London, Willimantic and Palmer.....	66	510,900	1,052,000	1,573,568	42,297	53,194	8,993	104,484	73,972	30,512	.....	.....
Housatonic	74	2,000,000	355,175	2,438,847	90,929	158,918	21,426	271,273	227,570	43,703	96,050	.....
Naugatuck	57	1,031,800	334,095	1,578,301	69,118	116,763	13,655	199,536	133,206	66 330	26,643	.....
Danbury and Norwalk.....	24	279,050	93,256	384,925	26,728	26,127	8,189	56,044	35,426	20,618	6,342	20,000
New Haven and Northampton	55	922,500	5,000,000	1,400,000	77,218	77,217	.....	154,436	103,636	50,800	35,000	46,125
New Haven, New London and Stonington...	62	738,538	846,452	1,454,040	59,969	8,823	7,966	76,758	67,818	8,940	1,270	37,700
New York, Providence and Boston.	50	1,508,000	306,500	2,158,000	117,843	83,095	7,500	208,439	111,867	96,572	21,455	.....
Totals	691	$18,727,367	$11,256,092	$26,462,545	$1,778,155	$1,161,367	$183,451	$3,117,976	$2,014,627	$1,103,349	$432,212	$423,825

The *above* table shows the following result:

	Per ct.
Rate of gross earnings to capital invested	11½
" net " " "	3¾
" expenses of all kinds to receipts	65
" dividends on capital *stock* paid	2½

The New London, Willimantic and Palmer, the New Haven, New London and Stonington, and the Providence, Hartford and Fishkill, paid neither dividends on their stock, nor interest on their indebtedness. The New London, Willimantic and Palmer, is in the hands of its mortgage bondholders, who are about foreclosing their mortgage. The Providence, Hartford and Fishkill is in the hands of its creditors. The amount paid to capital stock of these roads may be consideted as lost. Also a great portion of the capital stock of the Housatonic Railroad, which has perpetual leases of three unproductive roads, on account of which it pays out of its net earnings about $76,000 annually. This amount absorbs nearly all the net earnings of this road. The New York and New Haven loses about $30,000 annually on its lease of the New Haven and Northampton Railroad. These two roads have been badly victimized by unscrupulous parties, who got control of them at an early day. The only eminently successful road in the State has been the Hartford and New Haven. Since its final completion, it has never failed to pay 10 per cent. annually to its stockholders; the road in the meantime being maintained in excellent condition. The Naugatuck for a number of years earned a dividend on its stock, and may, very probably, do so again. For a detailed view of the working of all the roads in the State, we refer to the tabular statements in the JOURNAL of the 30th of April.

To Bridge Builders.

Attention is invited to an advertisement in another column calling for proposals for the construction of an extensive bridge over the Savannah river, 13 miles above Savannah, on the line of the Charleston and Savannah railroad. The bridge is to be of wood, in 6 spans of 144 feet each—in all 1,070 feet. All materials for its construction are easily obtainable. It is thought that at least two years will be required for its completion.

New York Central Railroad Company.

PRESIDENT'S OFFICE,
Albany, May 24th, 1859.

To the Editor of the AM. RAILROAD JOURNAL:

Sir:—My attention has been called to a letter published in your JOURNAL of the 14th inst., from the President of the New York and Erie Railroad Company in reference to the present low rates of passenger fare and of freight charges.

The Buffalo and Corning Railroad, of which Mr. Moran speaks, is the western end of the Erie Railroad, on which its principal business is transacted. Mr. Moran admits that he controls this road, and that they first reduced passenger fares and cattle rates. This company was of course obliged to do the same. In regard to freights generally, Mr. Moran charges that the reductions originated with this company. I had hoped to have been spared newspaper discussion on this subject, but as Mr. Moran has seen fit to commence it, I feel called upon to say in the most decided manner, that this statement in all its material parts is wholly unfounded, and that he knew, or certainly ought to have known, when he wrote his note to you, that

in the reductions to which he refers, we only followed the course of his road, or its immediate connections, which he might and should have controlled. The management of Mr. Moran has been such as to inflict a vast injury on all the leading railroad interests of the country. He initiated a system which has led to the most disastrous results; and now that the effects of it are visited with peculiar force on the road over whose interests he presides, he seeks to throw the odium upon others. But this will not do. The great body of the intelligent railroad managers of the country know that he is responsible for the present low rates. All the attempts thus far made, the last, since Mr. Moran's article appeared, to induce the Erie Railroad to return to former rates, have failed, and while willing to make certain advances on freight, in which they are most deeply interested, they have utterly refused to consent to restore passenger fares to their former standard.

This company insists on an increase in both passenger and freight charges, and they are entirely persuaded that time will prove the correctness of the course they have pursued under the circumstances which surround the questions at issue.

Yours, &c.,

ERASTUS CORNING, *President.*

Journal of Railroad Law.

CORPORATE SUBSCRIPTIONS TO RAILROAD STOCKS—POWER TO ISSUE BONDS.

In the case of Oelrichs vs. The City of Pittsburg, very recently tried in the United States Circuit Court in Pennsylvania, the principles of law regulating the validity of municipal subscriptions to the stock of railroad companies, were brought quite fully under review.

This action was brought by the plaintiffs, who are a mercantile firm in Hamburg, Germany, against the Mayor, Aldermen and citizens of Pittsburg, to recover $16,985 alleged to be due to the plaintiffs as interest on certain railroad bonds issued by the city and held by plaintiffs.

The plaintiffs produced in evidence coupons cut from the railroad bonds in question, each for six months' interest on $1,000—thirty dollars each. One class of these coupons were cut from bonds issued by the city to the Alleghany Valley Railroad. These bonds were issued by the city under an act of the State Legislature passed in April, 1857. Another class were coupons from bonds issued by the city under acts passed in April, 1852, and May, 1854, to the Pittsburg and Steubenville Railroad Company. Still a third class were from bonds issued under an act passed in February, 1853, to the Chartiers Valley road.

The bonds in question were issued under seal of the corporation, were signed by the Mayor, and attested by the Treasurer. The execution of them was not denied; but the defence claimed that they were invalid in law. Justice Grier gave the jury the following instructions among others:

The municipal corporation of the city of Pittsburg, though it acts through a special legislature elected by the citizens, is entrusted with special, not general powers. It may pass ordinances in regard to its internal affairs, to preserve the peace and the health of the citizens, to regulate the streets of the city, and, in fine, all other matters connected with it which come under the denomination of internal police for the better government of the city. It may borrow money for the special purposes of the trust and authority confided to them, and lay taxes to raise money for these purposes. But it has no power, by virtue of its act of incorporation, to exercise any discretion in making ordinances for the construction of canals, turnpikes or railroads, beyond the territorial limits of its jurisdiction. It cannot compel the citizens to become partners or stockholders in private corporations, or pledge, or encumber the individual property of the citizens in speculative undertakings. Its powers are only co-extensive with its duties. Hence the necessity of a special license from the Legislature to a municipal corporation to subscribe for stock in such corporations.

Whether the Legislature of the State may confer upon the officers of such municipal corporations the power to bind the people of a city or county by bonds, and to burthen them with taxes to raise money for external objects even of general interest, or to compel them to become partners in any and every incorporated association, is a question on which much difference of opinion exists. In this State, however, this question has been decided by your own Supreme Court, the only authoritative expounders of your constitution and statutes. To their decision, it is our duty to submit, without questioning its propriety.

Assuming, then, that the Legislature has the constitutional power to authorize the officers of a municipal corporation to bind the corporators by instruments such as those now declared on, with or without their individual consent, have they conferred it in clear and distinct terms? It is too important and dangerous a power to be assumed from inference or construction.

A statute may invest a corporation with powers contrary to the general rules of law, but they must be granted in clear and unambiguous terms; they will not be implied or presumed, and they must be exercised according to the strict interpretation of the grant. (Wilcox on Corp.; Kirk vs. Norvill, 1 D. & E., 124.) "This jurisdiction of a municipal corporation is local; its duties and its powers are local; and any power to act on subjects without, must be conferred by the legislature in language which cannot be mistaken."

1. The second section of the act of April, 1857, which is supposed to authorize the execution of the bonds in question, authorizes "any incorporated company, city or borough to subscribe to the stock of the railroad as fully as any individual." It is bare authority to *subscribe* for stock, or to become a stockholder in another corporation, as any individual might do. If the subscriber has money to invest in stocks, he may invest it in this railroad stock. The law gives the municipal officers permission, and nothing more. It confers no authority to issue bonds with or without coupons, or to tax the property of the corporators to pay for the stock or lift the bonds, or pay the interest on them.

The fourth section of the act of 14th of April, 1852, authorizes them to pay the amount of their subscriptions by transfer of other stocks held by them in other corporate companies; and the sixth section of the same act provides that the acts limiting the amount of corporate debts shall "not prevent either of said cities from subscribing" to the stock of the railroad. Here they are authorized to pay in stocks owned in other corporations, but not to contract debts or give bonds. And the release of a former disability cannot be construed to confer a power not before granted.

To support the plaintiff's case on this point, we must decide that the officers of the corporation have an unlimited power to subscribe the whole stock to build the road, say five to ten millions of dollars; and not only so, but to issue bonds, binding the corporators to pay principal and interest, and to lay taxes on their property for that purpose. In other words, to mortgage the whole income of the people of Pittsburg. The court must instruct you that such an enormous and irresponsible power as is here claimed, is not to be found either in direct terms or by any legitimate inference in the acts of Assembly. The power is to the full extent I have stated or it does not exist at all. You are therefore instructed that the officers of the corporation, defendant, had no authority whatever to issue the bonds and coupons, declared upon and now produced. This disposes of the case so far as regards the 403 coupons on the bonds issued to the Alleghany Valley Railroad.

2. Let us now examine the authority to issue the bonds to the Pittsburg and Steubenville Railroad Company. These are issued under two several acts of the Assembly, which we will examine separately. The first issue is by virtue of the authority conferred by the third section of the act of 21st April, 1852—which is as follows: (Justice Grier here read from the act.) Here we have a direct authority given, not only to subscribe for 5,000 shares of the stock of the railroad company, but also to borrow money to pay therefor, and make provision for principal and interest of the money so borrowed. But it is also enacted "that no certificate of loan or bond shall be for a less sum than $100, and *shall be transferable only on the books of the city.*" Are these bonds and coupons within the authority thus conferred. The bonds do not set forth how they are to be transferred, but refer to this act which authorizes their issue. This suit is on the coupons. But the covenant of the bond is to pay to the railroad company and their assignees. On the back of the bond is endorsed a blank power of attorney to make an assignment on the books, but no assignment has been made. The interest is but an incident to the debt, and unless the plaintiff had the bond assigned to him according to the act, he has no right to demand the interest. There is no covenant to pay to the holder or bearer of the bond, and the interest is due only to the legal holder by assignment, and cannot be made payable to a third person. The act gives no authority to the city officers to make such negotiable instruments, having a different mode of transfer from the bonds to which they were attached.

Where a bond is payable to bearer, the bearer of the coupon shows a *prima facie* title to have the interest, because he was owner or holder of the bond when he cut it off. But where no one can show a legal title to the bond, but an assignee of the bond, there can be no presumption that he is entitled to the interest by mere possession of a coupon. The plaintiffs cannot, therefore, recover on the evidence, or any of the coupons taken from the bonds of the first issue.

As to the second issue. The act is different. It does not restrict the bond to assignees on the books of the city, and provides for and authorizes the issue of the coupons.

3. Lastly, the Chartiers Valley road. (Justice Grier here read to the jury the act of February 7, 1853.) Here is full authority to make the bond and coupons transferable as shall be directed by the city corporation. There is no city ordinance shown directing that the bonds shall be coupon bonds, but the corporation have issued them in that form. It will be presumed that it was so directed by them. I see no reason why plaintiff should not recover on these coupons on the ordinance in the case, if believed by the jury.

The plaintiffs have a right to interest on the coupons which the jury shall find to have been legally issued under the previous instructions, with interest from the day of payment.

On the conclusion of the charge, the plaintiff's counsel desired that a non-suit be entered with regard to the Alleghany Valley bonds, and those of the first issue to the Pittsburg and Steubenville road.

The jury returned the following verdict: "We find for plaintiff the sum of $2,400, with interest, to be computed by agreement of counsel on the forty-six coupons of the second issue of the Pittsburg and Steubenville Railroad Company, and thirty-four coupons of the Chartiers Valley Railroad Company given in evidence."

The result of the trial as respects the interests immediately involved may be stated thus. The plaintiffs having been non-suited on the Alleghany Valley bonds, and the first issue of the Pittsburg and Steubenville bonds, he will be obliged to sue anew upon these. As to the Chartiers Valley bonds, and those of the second issue to the Steu-

benville road, it is understood that the case will be carried before the Supreme Court of the United States for review; on exceptions taken by defendants to the rulings of the court. The decision on that appeal will determine the constitutionality or unconstitutionality of the law authorizing these subscriptions.

Notice to Bridge Builders.

ENGINEER'S OFFICE C. & S. R. R. }
Charleston, May 23, 1859. }

SEALED PROPOSALS WILL BE RECEIVED AT THIS Office until 12 M., on Saturday, 18th June next, for the construction of a single-track railroad Bridge across the Savannah River, about thirteen miles above the City of Savannah.

The said Bridge will have (6) six spans of (144) one hundred and forty-four feet each; and a swing bridge (190) one hundred and ninety feet long, (giving two openings of 80 ft each.) The entire length of the Bridge will be about (1070) one thousand and seventy feet.

The superstructure of the Bridge to be of the most substantial character, and on the plan of Howe's Patent Truss.

The piers and abutments to be composed of cast-iron cylinders, (6) six feet in diameter; sunk by Pott's pneumatic process, through an average depth of (20) twenty feet of mud, sand, and gravel, and securely based upon the impenetrable substratum which underlies the bed of the river.

Proposals will be received at the same time for constructing the said Bridge on piers and abutments of brick, resting on piled foundations.

The plans and specifications, bills of timber and iron, may be seen, and all other information obtained, at this office, on and after Monday, 6th June.

EDWARD MANIGAULT,
Chief Engineer, C. & S. R. R.

LOCOMOTIVES.

2 LOCOMOTIVES, about 13 tons, (second hand,) 4 ft. 8½ in. gauge, in excellent order for sale at a bargain.

GEO. T. M. DAVIS,
New York, May 24, 1859. 2m 47 Exchange Place.

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FOR sale SIX HAND CARS, first class in complete order.
A. BRIDGES & CO.,
64 Courtlandt st.

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FOR SALE.

A MERCHANT IRON AND WIRE ROD **ROLLING MILL,** situated in the City of Wheeling, Va., with Coal banks in rear of the mill containing an abundance of good bituminous coal.

The cost of the fuel delivered to the furnaces is but two and a-half cents per bushel.

Attached to the mill is a **WIRE FACTORY** and its appendages. Also a **KIRK STEAM HAMMER** for **Forgeing Car Axles,** etc. There is extra shafting and surplus of power for other work if required.

The extraordinary **cheapness** of the **fuel,** and the facilities for obtaining metals, and for shipping, both by water and rail, to all parts, particularly west and south, makes the locality a desirable one for the manufacture of **IRON** in any or all its branches.

For particulars address either of the subscribers.

P. A. BURDEN, Lansingburg, N. Y.
C. DEWEY, Cadiz, Harrison Co., Ohio.
E. M. NORTON, }
P. C. HILDRETH, } **Wheeling, Va.** 8t20

PROPOSALS for $300,000 CENTRAL PARK IMPROVEMENT FUND STOCK.—Sealed proposals will be received at the Comptroller's office until THURSDAY, June 16, 1859, at 2 o'clock, P. M., when the same will be publicly opened, for the whole or any part of the amount of THREE HUNDRED THOUSAND DOLLARS OF THE CENTRAL PARK IMPROVEMENT FUND STOCK OF THE CITY OF NEW-YORK, authorized by an Act of the State Legislature entitled "An act for the Regulation and Government of the Central Park in the City of New York," passed April 17, 1857, amended April 13, 1859, and by an ordinance of the Common Council, approved by the Mayor, May 13, 1859.

The said Stock will consist of Three Thousand Shares, of One Hundred Dollars each share, bearing interest at the rate of six per cent per annum, payable quarter-yearly, and the principal sum redeemable on the 1st day of August, 1887.

The proposals will state the number of shares desired, and the price per share; and the persons whose proposals are accepted will be required to deposit with the Chamberlain of the city, within three days after the opening of the bids, the whole sum awarded and covered by their bids respectively, including the premium, if any, thereon, and on presenting the receipt of the Chamberlain to the Comptroller, will be entitled to receive a certificate for the par value of the number of shares, bearing interest from the date of such deposit.

Each proposition should be sealed up and indorsed "Proposals for Central Park Improvement Fund Stock," and the proposals, thus sealed and endorsed, put in a second envelope sealed and addressed to "Robert T. Haws, Comptroller, New York." The right is reserved on the part of the Comptroller to reject any or all of the bids, if considered necessary to protect or promote the interests of the Corporation.

Department of Finance, Comptroller's Office, New-York, May 17, 1859. ROBERT T. HAWS, Comptroller.

Notice to Contractors.

OFFICE OF THE DUBUQUE AND PACIFIC R. R. Co., }
Dubuque, Iowa, May 7th, 1859 }

PROPOSALS WILL BE RECEIVED AT THE OFFICE of the Dubuque & Pacific Railroad in Dubuque, Iowa, for the construction of said road from its western terminus to Sioux City.

The following are approximate estimates of the amount of embankment and excavation

	Embankment. Yards.	Excavation in earth. Yards.	Ex'vation in rock. Yards.
From end of present track, 2 miles beyond Nottingham to Winthrop, 20 miles,	125,000	56,500	700
Next 20 miles, west of Winthrop,	140,000	92,000	
From there to Cedar Falls, 20 miles,	165,000	105,000	
From Cedar Falls to Fort Dodge 92¼ miles,	1,116,000	150,000	6,590
From Ft. Dodge to Sioux City, 130 miles,	1,300,000	300,000	

The original estimates were for different gradients from those we now propose to adopt. The above estimates of work to be done are merely approximate, but are believed to be substantially correct. A large portion of the grading between the end of the present track and Cedar Falls, is already done; many of the culverts are put in; and the cross-ties for about forty miles are delivered. Timber will be substituted for masonry. Propositions will be received for road bed and superstructure, without fencing and without buildings, except water tanks; and the company will furnish rolling stock for construction.

The amount of grading, as will be seen by the above estimate, is exceedingly small; the material as a general thing, is black loam soil. Timber is convenient of access in the vicinity of all the principal streams as far west as Fort Dodge; from there to Sioux City it is quite scarce; there is considerable, however, in the little Sioux, and occasional groves and patches scattered over the intermediate country. The Big Sioux and other streams in the vicinity of Sioux City, furnish an abundance of good timber. Bituminous coal of fair quality exists in abundance on the Iowa, Boone, Desmoines and Big Sioux rivers. The Missouri river is navigable for steamboats from Sioux City to Fort Benton, 1,900 miles, as ascertained by actual measurement by several United States officers. The United States appropriated one hundred thousand dollars to open a military road from Fort Benton to Fort Walla Walla, the head of navigation of the Columbia river; and Lieut. Mullan, U. S. A., is now at work with a strong force opening that road. When that is done, and the Dubuque & Pacific Railroad finished to Sioux City, this must become the main route to Washington, Oregon, and the Northwestern British Possessions. The region of country near the head waters of the Columbia and Missouri rivers, is one of the most beautiful and desirable in the world, according to the reports of the U. S. officers who made the Pacific Railroad surveys. All who visited that region for a great distance north and south, east and west, again and again, express their delight and agreeable surprise, in finding a country so contrary to all their preconceived notions. It has a fine climate and fertile soil, and is in every respect considered a country capable of sustaining a dense population. Nineteen hundred miles of navigable water through such a country, to say nothing of the great through route to the Pacific, must be a powerful feeder to our road. In view of these facts, the company deem it advisable to commence work at the west end as well as at the east. Payment will be made in construction bonds, drawing seven per cent interest, which are a lien on the road and on the lands granted by Congress; in county bonds, and in such local means as can be raised on the line of the road. The land grant is three thousand eight hundred and forty acres per mile, the same as the Illinois Central; the greater portion of the lands lie between Fort Dodge and Sioux City; all are within fifteen miles of the road. The construction bonds are receivable at par in payment for lands; when land is paid for with these bonds, the mortgage by its own terms ceases to be a lien upon it. Two hundred and thirty thousand four hundred acres of land belonging to the portion of road now completed, will be offered for sale on the 6th of June next, for construction bonds at par, at an average price of about four dollars an acre. The company intend to put the bonds and lands at rates which will induce capitalists, in these times, to undertake the building of the road. We are well aware that no one will undertake a work of this magnitude without strong inducements.

At least forty miles of road must be completed by the first of December next; this can easily be done, as the grading and bridging is far advanced, and the cross-ties are delivered. However, the forty miles to be completed by that time may be in two pieces of twenty miles each, one at each end of the road. Propositions will be received for the building of the whole line, or for portions of twenty, forty or sixty miles. As each twenty miles of road are completed, the company are entitled to sell an additional seventy-six thousand eight hundred acres of the land grant. The building of the west end of this road offers a favorable opportunity for founding a half dozen or more colonies on a large scale.

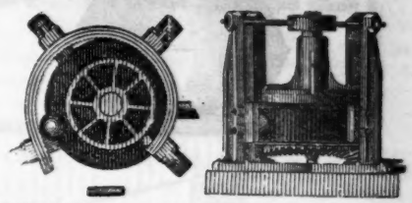
The company own, with but few exceptions, each alternate section (mile square) of land for fifteen miles on each side of the road. Twelve to fifteen stations may be located on the lands of the company; and the lands at the stations, except depot grounds and right of way, will be secured to the contractors. The vicinity of Sioux City is a favorite spot for German emigrants. It is believed that most of the work can be paid for in lands and goods. Considerable work was done at the east end of the road last year, for goods, at lower prices than the same work could formerly be done for money.

Maps and profiles may be seen, and further information had at the office of the company, in Dubuque, Iowa.

Adopted by order of the Board

F. S. WINSLOW,
PLATT SMITH } Corresponding Com.
J. M. REDMOND.

HENRY BURDEN'S
PATENT REVOLVING
SHINGLING MACHINE.



THE subscriber having recently purchased the Right of this Machine for the United States, now offers to make transfers of the Right to run said Machine, or sell to those who may be desirous to purchase the Right for one or more of the States.

This Machine is now in successful operation in ten or twelve Iron Works in and about the vicinity of Pittsburg, also at Phoenixville, and Reading, Pa., Covington Iron Works, Md., Troy Rolling Mills, and Troy Iron and Nail Factory, Troy, N. Y., where it has given universal satisfaction.

Its advantages over the ordinary Forge Hammer are numerous:

Considerable saving in first cost; saving in power; the entire saving in shingler's, or hammerman's wages, as no attendance whatever is necessary.

It being entirely self-acting: saving in time from the quantity of work done, as one machine is capable of working the iron from sixty puddling furnaces; saving of waste, as nothing but the scoria is thrown off, and that most effectually; saving of staffs, as none are used or required.

The time required to furnish a bloom being only about six seconds, the scoria has no time to set, consequently is got rid of much easier than when allowed to congeal, as under the hammer.

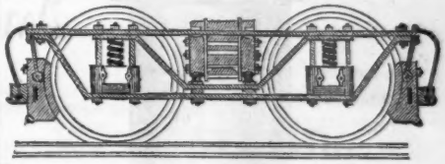
The iron being discharged from the machine so hot, rolls better and is much easier on the rollers and machinery.

The bars roll sounder, and are much better finished.

The subscriber feels confident that persons who will examine for themselves the machinery in operation, will find it possesses more advantages than have been enumerated.

For further particulars address the subscriber at TROY, N. Y.

P. A. BURDEN.



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ARE prepared to fill, at short notice, of the best materials and workmanship, orders for **Wrought** and **Cast Iron Work**, fitted ready for use, for the building or repairs of **Passenger** and **Freight Cars**, complete or in part.

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EFFECTUALLY obviates the **Formation of Scale on the Plates** by separating the incrusting matter from the water before it enters the boiler, at the same time condensing a large portion of the steam and *supplying the purified water to the boiler at about boiling heat.* The apparatus is compact, simple, and applicable to all kinds of Engines. Recent modifications render it still more efficient than heretofore.

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Probably no modern improvement connected with Steam Power combines so many advantages as this. **The economy of Fuel alone from its use soon repays the cost of the apparatus.** Prices reduced. Terms easy.

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27 CARS—Have been run about two years,—viz:—
5 long 8-wheel Box Cars, 2 with apartment for conductor
3 " " Cattle Cars.
19 " " Platform Cars.

These Cars are made in the best manner, with large axles, safety beams, brakes, lightner boxes, and have been newly painted and will be sold low for cash.

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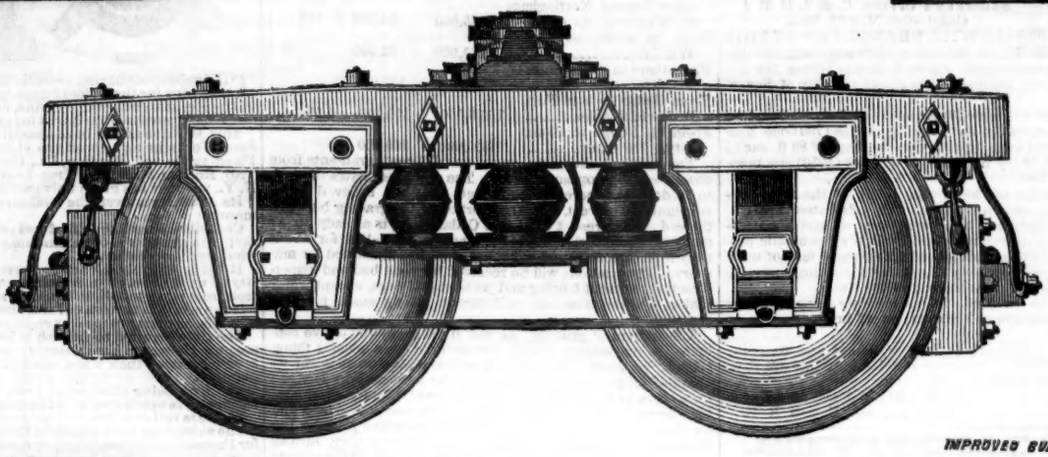

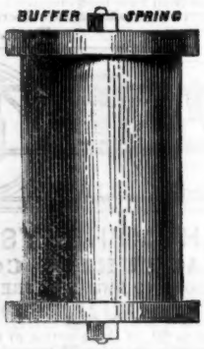

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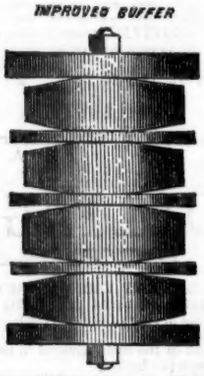

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Dubuque & Pacific Railroad Company.

THERE will be an election of seven directors of said Company on Monday the 6th of June, 1859, at the office of the Company in Dubuque.

JAMES M. McKINLAY,
Secretary.
5t19

WIRE ROPE.

THE subscribers having erected the most improved Machinery, are prepared to execute orders for **WIRE ROPE,** of all sizes and descriptions,

FOR COLLIERIES,
INCLINED PLANES,
STANDING RIGGING FOR VESSELS;
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TUCKER, COOPER & CO.,
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Also, manufacturers of Patent Manilla and Tarred Cordage, Packing Yarn, etc.

JAMES C. LANE,
Ex-Chief Engineer of Explorations in South-America, etc.
MECHANICAL AND CONSULTING ENGINEER,
Times Building, 41 Park Row.
Room No. 4, NEW YORK.

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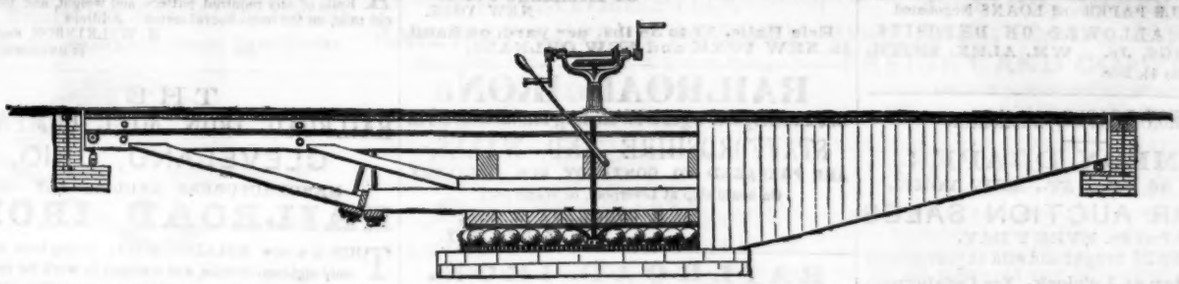
DRAWINGS, Specifications, and Models, (metal or wood.) Applications for Patents, and all business whatever connected with Patents attended to with economy and despatch. Application for PATENT, including drawings, specifications and Patent Office fees, **$60.**

Patents for Inventions.

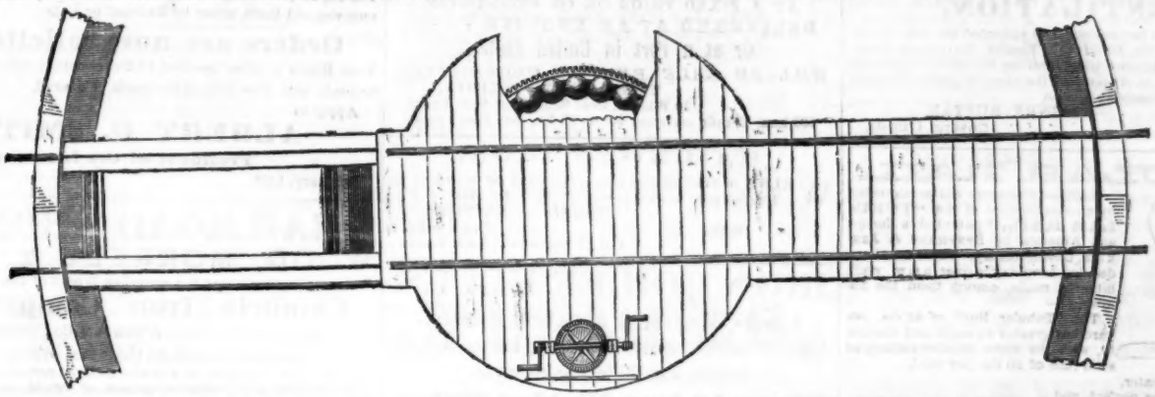
T. D. STETSON, Agent for procuring patents, No. 5 Tryon Row, (near City Hall). A circular with full information sent free by mail.

American correspondent *Prac. Mechanics' Jour* from 1854.

WARD'S PATENT
SELF-CENTERING TURN-TABLE.



THIS TABLE is adapted to all localities and climates—is constructed without the **Central-Pivot,** or **Rubbing Journals,** thereby improving with use.—It is **cheap, strong and durable,** and works with **ease** and **freedom,** requiring less expensive foundations, and suitable for the turning platforms of swing-bridges, mortar-beds, pivot-gun-carriages, etc.



These TABLES are already introduced, and give general satisfaction.—They are manufactured in TOLEDO, Ohio, by **R. F. RUSSELL,** of the "Toledo Novelty Works," and in ALEXANDRIA, Virginia, by **THOMAS S. JAMEISON,** to either of whom orders may be sent, or to the undersigned, patentee, at AUBURN, Cayuga County, New York.
May 2nd, 1859.

W. H. WARD.

FINANCIAL.

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The Undersigned, Agents for the Manufacturers,
ARE PREPARED TO CONTRACT TO DELIVER
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RAILS OF SUPERIOR QUALITY,
And of Weight or Pattern as may be required.
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Erie Rails, 57 to 58 lbs. per yard, on hand in NEW YORK and NEW ORLEANS.

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500 tons T rails on hand 54 to 57 lbs. per linear yard.

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August 16, 1854 1y33

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Orders are now solicited
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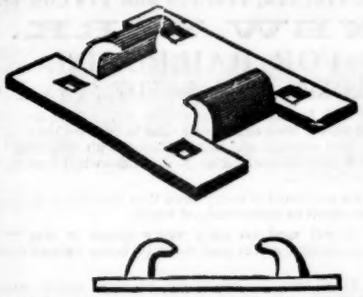

HAVING recently purchased, at Receiver's Sale, all the Patent Rights owned by the late *New York Wrought Iron Railroad Chair Company*, and also the entire machinery for manufacturing their improved Wrought Iron Railroad Chair, we are now fully prepared to receive and fill all orders from responsible parties, to any extent, with promptness and dispatch.

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This road can be built and equipped, without additional cost over a road with 56 lbs. T rail; saving not less than 60 per cent. on motive power, 50 per cent. on dead weight, and 80 per cent. on repairs of way; thus reducing the yearly expenses from $1,500, to $2,000, per mile. For full particulars, with drawings, relating to both roads, see a recent Treatise, entitled Railroads, their construction and management, with the remedy; from twenty-five years experience, by S. A. BEERS, Civil Engineer, BROOKLYN, N. Y. Price 50 cts. Address the author.

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STEAM ENGINES;
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STEAM BOILERS and WATER TANKS of any size or description. SHAFTING, PULLIES and HANGERS.

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HAVING extensive facilities, are now prepared to furnish promptly of the best and most improved description, either

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